EDISON ELECTRIC INSTITUTE BULLETIN

GEOGRAPHY, RESOURCES & INDUSTRIES

FEBRUARY, 1940

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EDISON ELECTRIC INSTITUTE

THE ELECTRIC LIGHT AND POWER INDUSTRY

Current Statistical Data Covering 100 Per Cent of Industry

DURING THE MONTH OF DECEMBER

	1939	1938	%
	SOURCE OF ENERGY		
Kilowatthours Generated (net)			
By Fuel Burning Plants	8,548,660,000	6,691,295,000	+27.8
By Water Power	2,758,649,000	3,554,675,000	−22.4
Total Generation	11,307,315,000	10,245,970,000	+10.4
Net Purchases			
From "Other Sources"	376,001,000	360,882,000	+ 4.2
Net International Imports	86,331,000	109,157,000	−20.9
Total Purchased Power	462,332,000	470,039,000	− 1.6
Total Input	**11,769,647,000**	**10,716,009,000**	+ 9.8
	DISPOSAL OF ENERGY		
Total Sales to Ultimate Customers	**9,760,220,000**	**8,779,316,000**	+11.2
Company Use, Etc.			
Used in Electric Railway Department	33,990,000	38,062,000	−10.7
Used in Electric and Other Departments	134,896,000	150,954,000	−10.6
Furnished Free or Exchanged in Kind	6,663,000	2,367,000	.....
Total Company Use, Etc.	175,549,000	191,383,000	− 8.2
Total Energy Accounted For	**9,935,769,000**	**8,970,699,000**	+10.8
Losses and Unaccounted For	1,833,878,000	1,745,310,000	+ 5.1
Total Output (To Check Above "**Input**")	**11,769,647,000**	**10,716,009,000**	+ 9.8
	CLASSIFICATION OF KILOWATTHOUR SALES		
Residential or Domestic	2,000,248,000	1,847,338,000	+ 8.3
Rural (Distinct Rural Rates Only)	(Allocated to	Other Classes)	.....
Commercial and Industrial			
Small Light and Power (Retail)	1,861,519,000	1,615,637,000	+15.2
Large Light and Power (Wholesale)	4,924,924,000	4,330,104,000	+13.7
Public Street and Highway Lighting	203,407,000	193,860,000	+ 4.9
Other Public Authorities	204,711,000	217,832,000	− 6.0
Street and Interurban Railways	360,873,000	392,416,000	− 8.0
Electrified Steam Railroads	171,191,000	154,832,000	+10.6
Interdepartmental	33,347,000	27,297,000	+22.2
Sales to Ultimate Customers	**9,760,220,000**	**8,779,316,000**	+11.2
	ESTIMATED REVENUE		
Revenue from Ultimate Customers	$206,238,800	$197,111,200	+ 4.6
Other Electric Revenue	2,275,300	1,986,900	+14.5
Total Revenue	$208,514,100	$199,098,100	+ 4.7
	RESIDENTIAL OR DOMESTIC ELECTRIC SERVICE— 12 MONTHS ENDED DECEMBER 31st		
Kilowatthours per Customer	900	853	+ 5.5
Average Annual Bill	$36.54	$36.08	+ 1.3
Revenue per Kilowatthour	4.06¢	4.23¢	+ 4.0

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EDISON ELECTRIC INSTITUTE BULLETIN

Volume 8 FEBRUARY, 1940 No. 2

Progress of the Electric Utilities Under Private Ownership

By H. S. Bennion

Vice-President and Managing Director, Edison Electric Institute

Paper presented before the New York Section of the American Institute of Electrical Engineers, New York, Feb. 13, 1940

THIS is called the Electric Age. It is generally accepted that the electrical industries are in the very forefront of the march of progress. The harnessing of the forces of electricity to practical tasks is still a relatively young enterprise. It is encompassed within the span of a lifetime.

The world confidently looks forward to more great things from electricity to add further to the wellbeing of mankind. It has seen such miracles in discovery and achievement in the use of electricity that it seriously counts on more and more benefits from this same source, and assumes that the storehouse of new electrical developments is still full, waiting only for the scientists and the engineers to unlock more doors.

Asset and Responsibility

This sentiment of expectancy is a great asset to the electrical industries and at the same time a great responsibility. It places them in a somewhat difficult position, for the world has no concept of the labor, skill, and genius which is required to make new advances in the industrial arts and does not realize the importance if these are to come of maintaining conditions conducive to great accomplishments therein.

The electrical industries have formed one of the most fruitful fields for the employment of engineering talents. From the beginning of electrical development the marvelous characteristics of electricity spurred the fancy and imagination of able young men, and electricity's great potentialities for commercial enterprises were early recognized. The electrical industry has drawn to its service large numbers of men of native ability and technical training and extracted from them their best efforts because it rewarded them with the satisfaction of one success after another and at the same time enticed them on with a wide variety of unsolved, baffling problems to challenge their skill and efforts.

The history of the development of the electric utilities is generally familiar to this audience, but there is profit in an occasional review to stimulate the memory and the interest with a few of the more significant or revealing items. It helps one to see more clearly the present position of the industry and to comprehend a little better the direction in which it is traveling. It helps one to perceive some outline of the pathway ahead, to glimpse the opportunities and the new avenues opening up, to indicate some way round or through the obstacles and difficulties that seem to be blocking the path, and, what is more important, to give assurance that these can be surmounted in due course.

Beginnings

The supplying of electric energy as a commercial enterprise began about sixty years ago, when small steam driven generators of 5 to 20 kw capacity were built and began to be put into operation. The six Jumbo generators in Mr. Edison's Pearl Street Station in New York City had a capacity of 120 kw each. At the same time a 40 hp generator driven by a water wheel was installed and put into operation at Appleton, Wisconsin.

One of the early problems of the electric industry was the transmission of power from the engine to the dynamo. An industry committee was organized in the 1880's to study shaft and belt problems. In discussing this subject at the September, 1886, convention of the National Electric Light Association in Detroit, Mr. John A. Pentz of Philadelphia said:

"First of all, the following statement will be conceded by everyone present: We cannot get power through complicated machinery, economically . . . .

"Plainly stated, if the steam could blow directly upon a wheel, without piston or valve gear, as the wind does upon a windmill, which we may say is secured upon the dynamo shaft, the problem would be solved, provided the power could be employed in this way as cheaply and as conveniently as is usually done through a more complicated piece of machinery, which we call a steam engine. But inasmuch as this system has been tried in many ways and found *not* to answer, we must look to other methods nearest approaching the cheaper way, as concerning the cost of transmission, regarding less, however, the first cost of the motor."

Power Generation

Boilers and steam engines were fairly well developed when the electric light industry had its beginning. The steam turbine was a European development. In 1900 it was adopted by this industry when a large turbine was installed at Hartford, Connecticut. The turbine quickly superseded the Corliss cross compound engine which appeared to be limited to a capacity of 10,000 hp.

In the course of time metals have been found and designs perfected to raise boiler pressures from 100 lb per square inch to 1200 and 1400 lb, with trial installations as high as 3300 lb pressure. Temperatures have been raised from 350

deg. Fahrenheit to 950 deg. Turbines have been increased in size and efficiency to as much as 165,000 kw in a single unit. There have been added mechanical stokers, pulverized fuel, superheaters, economizers and various other devices to improve economy, until the best station can now produce a kilowatthour of net station output with three-quarters of a pound of coal, and there are entire large systems of several generating stations which show an annual operating performance of a kilowatthour per pound of coal, as contrasted with 10 lb of coal per kilowatthour when the first steam power stations were built, and 5 lb of coal per kilowatthour when the steam turbines were introduced. The thermal efficiency, which in 1882 was 10 per cent and in 1903 15 per cent at best, is 30 per cent in the most efficient stations today.

Along with all this marvelous improvement in efficiency, engineering skill has enabled electric utilities to build new steam stations of the best efficiency at about 80 per cent of the cost of steam stations built 40 years ago, and at two-thirds the cost of the most efficient stations of 20 years ago. This has been achieved notwithstanding the fact that hourly rates of pay of labor have increased 175 per cent in the 40-year period, the cost of living has increased about 110 per cent, and the ratio of taxes to gross revenue has grown 500 per cent. During this same interval the delivered cost of coal has doubled.

The efficiency of steam stations has now approached the maximum possibilities of the steam cycle, but scientists and engineers are not stopping there in their search for means of capturing a bigger percentage of the energy locked up in a pound of coal—energy equivalent to that of a ton of water falling a distance of one mile. The gas turbine, now a reality, promises higher efficiency, and still other means to make still greater gains are under study.

When hydro generation began in the early 80's of the past century, water wheels had an efficiency of 75 per cent. In the course of time this efficiency for heads ranging from a very few feet to more than a half mile high has been improved in the water turbine and water wheel to about 94 per cent. This leaves little room for further improvement. Advances in steam generation, however, during the past 10 to 15 years have caused electric utilities in general to turn to that type of power for their additional power requirements.

Transmission and Distribution

The transmission and distribution of electric power has a fascinating history. The extraordinary quality of electric energy is its flexibility, the relative ease with which it can be subdivided and carried to the most convenient place for getting work done and to the points where light or heat are wanted. The three-wire direct current distribution system evolved by Mr. Edison provided what then seemed to be a marvelous radius of operation for the supply of power from a single generating station. Experience with this system led many of the industry leaders to conclude that there should be a generating station planted in the center of every square mile wherever the density of customers would justify.

At the first meeting of the National Electric Light Association in 1885, one of the questions submitted and given lengthy consideration was "incandescent lighting, particularly in regard to length of circuit upon which it can be run with profit." Mr. Elmer A. Sperry, inventor of the Sperry Gyroscope, was the first discusser. He said:

"The fact that we are not able to transmit a perfect current to a great distance is attributed only to the fact that it is a high quantity and a low motor force. The matter, with regard to the transmission of the electric light to a long distance, can only be, in my mind, solved by some method of carrying a high tension current to the point where the incandescent light is to be used. Then there should be a storage cell, or some means, or motor, to transfer the current to a low force, suitable to the operation of incandescent light."

William Stanley's development of the transformer and the building of the first alternating current central station in 1886 supplied the means for solving the problem outlined by Mr. Sperry a year and a half earlier when he discussed the economical length of incandescent lighting circuits.

At the February, 1887, convention of the N.E.L.A. in Philadelphia, Dr. Otto Moses read a paper on "Electrical Distribution of Energy by Means of Secondary Generators." In this he described the practical need for high tension transmission and low voltage in the wiring on a customer's premises. In speaking of the transformer, he said:

"Now, if a current is made to circulate around a closed magnetic circuit (which is in reality a part of the original circuit) a counter electromotive force is started up which prevents the consumption of current—the reverse of the case of the incandescent lamp just cited. That is a fact that I never cease to wonder at. I bow my head in perfect bewilderment over it, considering how little it was understood in the first attempts that were made at distribution of the electric energy by secondary generators, and how absolutely essential it is to a successful distribution."

Dr. Moses discussed at length the lack of need for a moving coil in the transformer and then in imagination pictured transmission lines from Niagara Falls to New York and from the coal fields to the seaboard.

In 1888 the N.E.L.A. Committee on Electrical Distribution by Means of Alternating Currents gave a report on one year of the "commercial success of that branch of electric lighting in which induction coils are used." The report stated that the "practical use of the induction system has not only succeeded in commercially converting high tension electricity to low tension for electric lighting purposes, but also high tension theoretical opponents by practical demonstration of facts." In speaking of troubles encountered, the report cited,

"the weaknesses which developed in this apparatus were, first, the liability of the current to jump across the coils in the event of the field being excited with the armature circuit open. This open circuit sometimes happened by a dead cross occurring some place in the mains, blowing the fuse at the dynamo, thus opening the circuit and then the field being fully excited the armature would generate an exceedingly high electromotive force for an instant; the current under the circumstances would be very liable to jump across the coils of the armature and other hurtful effects to the machine would ensue."

Transmission

The early installations of long distance high voltage transmission lines took place in connection with water power developments to connect an available power site with an existing or potential market for electricity. According to local histories a number of the western states enjoyed the distinction of having the first high tension long distance transmission line, and each claimant is right according to his definition of these terms. In 1890 there were transmission lines with a voltage of 4000. In 1900 the highest voltage had risen to 55,000 volts, in 1910 to 132,000, and in 1923 to 220,000 volts, where the practice has been inclined to remain. At the present time the highest operating transmission voltage is 287,500 volts on the Boulder Dam-Los Angeles transmission line.

The mileage of power lines at or above 33,000 kv increased from 26,400 circuit miles in 1917 to 100,590 circuit miles in 1927, to 138,500 circuit miles in 1932, and to 145,000 miles in 1938. In spite of this great mileage of transmission lines, it is estimated that the average kilowatthour travels but 22 miles from the point of generation to the point of con-

sumption and has changed but little in the past fifteen years. Excluding the Pacific Coast and Rocky Mountain areas with their relatively long distances between the hydroelectric generating plants and the market centers, the average distance for the rest of the country is about 18 miles.

Factors Affecting the Transmission of Electric Power

The basic reason for transmitting power has always been the margin of difference between the cost of generating the power at a more favorable location and the cost of generating it at the point of use. One of the serious transmission problems from the beginning has been the effect of lightning. Large areas of the United States are subject to frequent and severe electric storms. In recent years great strides have been made in protecting electric service from the disruptive effects of lightning storms. This progress constitutes a great achievement of organized, systematic and persistent research, and the degree of success attained is a factor definitely favorable to long distance transmission of power. But the mounting costs of rights-of-way in populous areas is a factor generally unfavorable to such long-distance transmission; also the lowering costs of steam generated power have been a factor tending, in spite of the increased mileage of transmission lines, to reduce the average distance of power transmission.

At the present time, it is clearly the judgment of the great majority of power engineers and of the public that each large consuming center should have its own adequate generating capacity. This sentiment is indicated by a statement which appeared in *The Electrician* of London a year ago, commenting on a serious outage that had occurred three months earlier. The Electric Supply Committee, reporting to the Birmingham City Council, recalled that in its various reports to the Council, the Committee had from time to time "not failed to stress the vulnerability of the Grid and to say how preferable from the point of view of the continuity of supply independent operation would be to Birmingham with fully equipped local power stations covering load demands of the city and its environs."

Distribution

The art of power distribution by comparison with steam generation has made relatively small advances during the past few decades. This plant facility is more closely circumscribed by the physical characteristics of communities, by trees and buildings, streets, highways and roads, by regulations and codes to insure public safety and convenience, so that engineers are limited and hampered in their efforts to effect improvements. In addition, other utility services have to reach the same public and in the interest of the lowest overall cost to the public, no one service can reasonably make changes in its distribution practice that is not to the overall advantage of the public considering all types of service affected.

Distribution materials and methods of distribution have been and are being simplified and standardized to improve the reliability of service, to improve voltage regulation, improve accident records, and to reduce costs. It has been a whittling process but one that has been proceeding

continuously, and in aggregate the results are enormous because of the vast number of items affected, customers' services, distribution transformers, poles, insulators, etc. The savings, though individually small, are multiplied by very large numbers. A fifty cent reduction in the cost of a service switch may look insignificantly small, but if a generating station is supplying 100,000 customers, this fifty cents represents an aggregate saving of $50,000, and such a saving in the generating station itself would at once be recognized as important.

The capacity of distribution lines has been greatly enlarged to meet the needs of increasing customer consumption, and this has been done at a minimum of additional expense. Careful planning has helped to accomplish this, and it has prepared the way for meeting further increased loads as economically as possible. Advantage has been taken of the latest developments in conductors and in wood preservation to reduce construction and maintenance costs, and advantage has been taken of the savings possible through standardization. Good engineering and organization have given rise to improved equipment and better methods to offset increased labor prices and thus keep both installation and operating costs down. This has been most pronounced in rural construction, where pole line costs in general have been cut in two.

Literature of the Federal Government would credit this latter engineering achivement to the engineers of the Rural Electrification Administration, but an examination of published articles and reports by engineers of electric utilities and of the minutes of their engineering committees, long antedating the advent of this Federal agency, is enough to discredit these unwarranted claims. These advances do not come about by fiat or by sudden wish. Back of them are advances in metallurgy, improvements in machinery and in transportation, many engineering and economic studies, scores of practical tests, a considerable number of installations, observations on operating results, analyses of data on failures, research on wind and storms and long negotiations to effect agreement in code and regulation changes. These are the things that bear fruit in lower cost power lines and greater reliability. They require a long period of time, the free interchange of information and the intelligent expenditure of many man-hours of work.

It has been such effort that has enabled the cost of electric service to travel sharply counter to the cost of living and to the cost of government, so that, compared with 1913, before the World War, the cost of electric service through retail distribution to domestic customers is now less than half of what it then was; while the cost of living is 145 per cent of what it was at that time, and the per capita cost of government is 430 per cent of the 1913 level.

Services and Wiring

One of the links in the electric circuit between the source of supply and the point of consumption is the service entrance to the customer's premises and the wiring within such premises. In the earliest days of electric service the installation on the customer's premises proved to be a matter of real concern. In 1887 a committee of the National Electric Light Association submitted a report on the insulation of conductors and the protection of apparatus and safety of installations on their customers' premises. Its initial report set forth preliminary leakage tests for arc wires for incandescent wires, absorption tests, frost tests, flexibility of insulation, abrasion tests, adhesion of the insulation, refractory qualities of the insulation, ignition tests, conductivity tests, and flexibility of conductor tests. Because at the very beginning capable and experienced men dug out the fundamental requirements for interior wiring, the early installations have long and faithfully served their purpose.

In the meantime, however, the engineering on this part of the electric circuit has lagged far behind advances in the other parts. But in recent years, considerable progress has been made in methods and materials, and it may be predicted that in the next ten years, both in new construction and in existing buildings, advantage will be taken of these new developments so that the use of electricity will not be choked at the point of consumption.

Underground Construction

Underground construction is found in the downtown section of nearly all of the larger American cities. The placing of circuits underground early became an important factor. In August, 1885, at the second convention of the N.E.L.A. in New York, Mr. Ralph W. Pope read a paper on this subject in which he said:

"While there may be a difference of opinion as to the authority of the State to compel the abandonment and practical destruction of the overhead plants which actually exist, and which have been constructed in accordance with the requirements of the proper authority, there can be little doubt that the building of new aerial lines in the future may, and probably will, be absolutely prohibited in the cities of New York and Brooklyn.

In 1887, at the Pittsburgh convention of the N.E.L.A., papers were presented on undergrounding of electric light arc wires and on underground conductors for electric current. In a paper on this latter subject, Mr. Jesse M. Smith discussed the problem of insulating underground conductors. To quote from him:

"A few years ago wire wound around with a little cotton soaked in paraffine was thought sufficiently insulated until the insurance companies had a few losses, due of course to electricity, and then we had Underwriter's wire. The name of this wire has sold hundreds of tons of it, but that does not prevent its grounding a whole system when it comes in contact with the least moisture. It, however, marks one state in the evolution of the perfect insulation."

At the conclusion of Mr. Smith's paper he ventured to say:

"The underground conductor of the future, I believe, will be formed with a core of copper cable, thoroughly insulated by any of the standard and well-tried compounds, protected by a close-fitting lead casing, thick enough to resist mechanical injury, and buried in the earth in such a manner that it may be tapped at any point.

"But where is the money coming from to pay for these conductors?"

Underground construction still remains much more expensive than overhead construction and the question, where is the money to come from, still confronts us. The design and fabrication of materials for underground facilities, methods of construction, maintenance and operation have been and are being improved by the same processes of research, study, analysis and trial that have brought advances in overhead construction and operation. This has enabled the underground distribution of enormous quantities of power at a feasible cost, but the industry and ingenuity of the best engineering talent have not been able to overcome the inherent elements of cost in underground systems. Since the introduction of underground systems, the paving of streets has become thicker and much more extensive and street traffic has become denser, to make it much costlier to disturb the pavement. The congestion of underground services of one kind or another has multiplied many times. In the larger cities in some areas this concentration of facilities under the streets is a marvel of space utilization. (Considering all the room there is in this vast country, it is difficult to explain why men should pile up so in one spot.)

Advances in the art of cable construction have permitted raising the operating voltage from 220 at the outset to the

more common voltages at present of 11,000 to 33,000. Several miles of underground cable at 132,000 volts were placed in operation in 1926 in New York and Chicago. In Paris, France, in 1936, twelve miles of underground cable at 220,000 volts were placed in operation.

Availability of Service

The cost of electric power is so low compared to other things the dollar can buy that the availability and reliability of electric service is actually of greater importance than its cost. This has been demonstrated time and again in periods of business depression. The householder and the proprietor of the business establishment are slow to cut down on their use of electricity. They forego many other items of expense before curtailing their use of electricity. The residential use of electricity in this country dropped behind its previous level only once during the great depression. That was in 1933, and then the reduction was only 1 per cent. The retail commercial use of electricity, which reached a high in 1930, did not surpass this level until 1936, but its lowest point, in 1933, fell back only 21 per cent. These records show that the customer knows electric service is worth more to him than it costs him.

At the beginning of the industry, the distribution of electricity was feasible only in the downtown sections of the larger cities. Residential service could only be afforded in the town homes of wealthy families. There was a good demand for the advantages of electric lighting in much wider areas but financial and enginering problems of great magnitude had to be solved before this demand could economically be satisfied. Under the private enterprise system such developments proceed in an orderly fashion as technical and operating advances render feasible the extension of the service. In other words, the business is made to pay its way.

In 1890, at the end of a decade of the electric light and power industry, the total number of electric customers was 25,000. 325,000 were added in the second decade; 2,650,000 more were added in the third, and 7,750,000 were added in the fourth decade. This brings us up to the end of the World War. Immediately thereafter the extension of electric service to the families living in small towns and villages and to the families of below average income in the urban centers gained tremendous momentum. In the decade from 1920 to 1930, almost 16,000,000 customers were added. In the past nine years the increase has been about 4,200,000 customers. This sharply reduced rate reflects the already high saturation reached, the influence of the depression and the slower population growth.

At the present time 80 per cent of the population of the United States has electric services. Electric utilities serve approximately 40,000 cities, towns, villages and crossroads hamlets. This is a country of vast distances in which a substantial part of the population is living in remote places, and a considerable part of the rural areas is populated by Negroes and Mexicans with very low incomes. In no other areas of the earth's surface of similar size does the customer saturation approach that of the United States. There are a few small densely populated countries that have made electric service available to a higher percentage of the potential customers. In the more densely populated areas of this country, however, electric service is available to substantially 100 per cent of the possible customers.

At the end of 1923 there were sixty-two communities with a population greater than 2500 and there were 7940 communities with 250 to 2500 population that did not have electric service. At present there are perhaps one hundred communities with a population of over 250 that do not have electric service, and there are 22,000 communities of less that size that do have electric service. Approximately one-third of the customers of the electric light and power industry reside in rural areas and in communities of 2500 or less population.

Beginning in western irrigated areas in the late 1890's, farm electrification had increased until there were 200,000 electrified farms when the first count was made in 1924. This was an incomplete count and the figure is too low. In 1930 the number of electrified farms had increased to 650,000. This was still an incomplete count, too low by perhaps 10 per cent. Low farm incomes during the five years following 1930 put a stop to farm electrification for a time, but when it got under way it increased rapidly. This was partly due to the fact that the government in 1935 introduced a rural electrification program and appropriated large sums to carry it out.

At the end of 1939 about 1,780,000 farms had electric service. Of these, 1,400,000 were served by electric utilities and 380,000 by agencies financed by the Rural Electrification Administration. The total was 28 per cent of all the farms in America.

Standards of Service

In 1912 the McGraw Central Station Directory showed 3056 electric plants in the United States giving no daytime service. In 1918 there were still 1832 plants without daytime service. Such plants soon disappeared after the World War and electric utilities brought 24-hour service at standards of voltage regulation and reliability comparing favorably with urban standards to the millions of rural customers they served. This accomplishment was largely due to the help in financing, engineering and management provided by holding companies to operating subsidiaries.

Electrification of Industry

Beginning to attain substantial proportions by 1914, the electrification of industry, following the World War, proceeded by leaps and bounds until today over 70 per cent of the power used in factories, mines and quarries is now purchased from central stations. The process of electrification is continuing but at a reduced pace because of the nature of combined heat and power requirements of many of the largest industrial establishments.

Rate of Growth of the Industry

The superposition of the rapid acquisition of industrial loads by electric utilities upon the rapid expansion of the number of customers in the 1920 period has misled students of charts in their estimates of the probable future rate of growth of the industry. This future growth is closely bound up with population growth and with the rate of growth of industry and commerce. New electric uses are being discovered and developed and more may reasonably be expected, but fundamentally the electric industry cannot expand for any long period much faster than the population and the business which it serves. Its prospects are closely bound up with the prospects of enterprise in America in general. At the present time it appears that the normal rate of growth of the electric light and power industry is between 3 and 4 per cent per annum.

Sales of Power to Industry

The first use of electricity in industry, as in other fields, was to furnish lighting. The invention of the induction motor in 1888 by Nikola Tesla opened up a broad field of usefulness to industry. The application of electric energy to heating, melting, welding and, by means of infra-

red waves, for drying, has been increasing substantially in very recent years.

In 1919, in the manufacturing industries of this country, according to the Bureau of the Census, the total horsepower of prime movers was 29,324,000. Of this amount 9,282,000 hp was in electric motors driven by power purchased from electric utilities. In 1929, the latest year for which such data are published, the total for prime movers was 42,931,000 hp, and of this total 22,776,000 hp was driven by purchased electric power. At the present time it is estimated that more than 70 per cent of the total horsepower in industries is driven by purchased power.

The electric utilities will continue to get the major share of this market if not prevented by discriminatory taxation or prevented indefinitely from entering the market for new capital because of injury to their financial standing.

The use of electricity in industry, of course, rises and falls with industrial activity, but there has been a large increase in the degree of electrification and this is still progressing at the present time. It is a process that requires sales cultivation, but it is the opinion of the best informed sales executives that there lies ahead a vast market in further industrial electrification.

In 1939 industrial power sales were 24 per cent greater than in 1929, yet the Federal Reserve Index of Industrial Activity averaged 105 in 1939, or 14 points lower than the 1929 Index average of 119.

Sales to Commercial Customers

Sales to retail commercial customers have been increasing steadily for many years. Lighting constitutes much of this increase but new uses have developed to contribute substantially to this amount. It is the opinion of leading sales executives that the commercial load has more potential opportunity for expansion than any other class of service at the present time. This is the field toward which they are directing their greatest sales efforts.

Domestic Use of Electricity

The application of electricity to household tasks, although not so vital to the economic well-being of America as is its application in industry and commerce, always has been the class of service that drew the lion's share of attention. It is less vital because opportunities to gain and to increase the family income are much more consequential than home conveniences.

The first use of electricity in the home was for lighting. About 1910, when the carbon lamp was still in common use, the annual charge for lighting six or eight lamps around the house was nearly as great as the average annual domestic bill of today, which bill pays for about 10 times as much light, and in addition operates an electric iron, a radio set, half a refrigerator, and two or three small appliances, all thrown in for the same money. The increase in the average annual residential use of electricity has advanced very considerably during the past 20 years. If on the chronological chart are marked the dates when various domestic electrical appliances began to be accepted by the public, the growth of electricity use by the domestic customer is largely explained. An offsetting factor to keep this curve from mounting faster than it has mounted is the improved efficiency of appliances. The present electric lamp, for example, is three times as efficient as the carbon lamp which was superseded about 1910. The average refrigerator of 1925 used about 600 kwhr per year where the average of the newest refrigerators now being built takes only 240 kwhr. It takes 2½ new refrigerators to replace the consumption of one old machine retired from service. The electric range, which used to be figured at an average annual consumption of 1800 kwhr is now figured at 1200 kwhr.

The increase in use of electricity by the domestic customer has brought a corresponding reduction in the unit price for electricity. For many years electric rates have followed the inducement form whereby the unit price automatically goes down with the amount used by the customer, so that in reality he makes his own rate. Rate reductions have helped to induce greater consumption of electricity, but the predominant factor in its greater use has been the invention of current consuming devices, their public acceptance and the lowering cost of these devices, made possible by mass production.

Lighting and small motor appliance uses in the homes have been built up to produce an average consumption of about 700 kwhr per year and this average will undoubtedly be raised still higher. Pending the advent of further new inventions to boost domestic sales, much larger uses of electricity in the home must depend on its application to various heating purposes—cooking, water heating, space heating.

In some parts of this country and in some parts of the world the relation between the cost of generating electricity and the price of domestic fuels enables electricity easily to compete with them, and in such areas large domestic use of electricity prevails; but in most parts of this country one or more of these fuels is relatively so cheap and so conveniently available that progress in the application of electricity to the various household heat uses must be relatively slow. The combined gas and electric bill in most of the cities of the United States is substantially below the all-electric bill for the same identical household purposes in the areas of lowest cost electricity in this and other countries. This is why most of the growth in the use of electricity for cooking, water heating and other purposes has taken place in areas not reached by gas mains. Notwithstanding this competitive relationship, however, the use of electricity for heating purposes will surely continue to grow in the face of severe competition, because many American people are willing to pay a premium for convenience in their homes.

Contributions of the Electrical Manufacturers

In the electrical industry, the manufacturing of machinery and equipment has been a development apart from the business of supplying electric service. It would be difficult to appraise fairly the importance of the role played by the great manufacturing companies in the advance of electrification. They have done much of the research and development work. They have used the arts of salesmanship to induce electric utilities to discard older equipment for equipment newly devised, sometimes hardly waiting until an installation had been completed before setting out to prove that a utility could afford to scrap what it had for something still better. They have exerted this same sales effort with business and industry and with the public in general to induce them to buy their wares, and they have been a spur and a goad to electric utilities to direct their efforts toward building up the market for their products. Both from the standpoint of the machines they have produced and the driving force toward enlarging the market for electric energy, they have played a leading part in achieving the advances in electrification that have been witnessed. Their interests have generally, though not entirely, been parallel to those of the electric utilites. They were interested in making and marketing the machines which generate, transmit and

use electricity, whereas the utilities have been interested in the operation and maintenance of this equipment and in the sale of electric energy. It has been important for the engineers of both branches of the industry clearly to appreciate the interests in common and divergent interests, and for each to further the interests of the business in which he was employed in order that the public might have the advantage of the best overall results. Because of the high calibre of men in both branches of the industry and their devotion to the work in hand, this job, in my opinion, has been handled with an unusually high degree of excellence, and the traditional insistence on getting the best answer has made for remarkable progress.

At the very first meeting of the National Electric Light Association the imperative need for standards, first for standard wire gages, was recognized, and from this beginning there has developed a body of standards in the electrical field which more completely and perfectly fits the needs of the industry than is found in any other large industry in the world. These standards enable all the parts of an enormous and varied organization to speak with assurance the same language in their dealings one with another. Considering the complexity of the electrical business, this is a great engineering achievement and a monument to the zeal and devotion to the cause of progress on the part of many able engineers, for much of that work was carried on as a voluntary contribution of time and knowledge by many individuals and companies.

Electrification Growth in America and Europe Compared

From the outset electrical development in America set the pace for the entire world. Utility engineers and operators from every land came and have continued to come to the United States for information, guidance, patterns and methods. The reports of American industry committees, engineering and commercial, have been textbooks in demand the world over ever since the electric utilities were organized in trade associations 55 years ago.

In 1925 the United States was producing half of the world's output of electric power. Today we produce about a third, for in the past decade the rate of increase in foreign countries has been faster than in this country. It is easier to catch up than to push on ahead, and representatives of foreign nations all have been most generous in acknowledging to this very day our vanguard position in the field of electrical development.

What were the factors which caused electrical development to proceed so much faster in this country than elsewhere? The early discoverers of the characteristics of electricity were largely Europeans. After the American Benjamin Franklin came Faraday, Volta, Ampere and others. Europe has produced many noted electrical and mechanical engineers, several of whom came to this country for greater opportunity.

Fundamental factors which account for the leading role this country played in electrical development are as follows: This was a land of free enterprise which gave free play to the best engineering, managerial, commercial and financial talent. Men labored under a minimum of government restrictions and promising rewards made the very best men exert their ingenuity to the limit and to labor without stint for the accomplishment of their purposes. Their government gave a maximum of confidence in the stability of money values and in the right to enjoy the full fruits of their skill, labor and thrift. At the same time the richest commercial field to be found anywhere on the face of the globe was open to them, because the same opportunities and incentives that were presented to the electrical field were also open to all other fields of endeavor, with the result that the average earning power of American families and of American business were far above those of other countries.

These were the principal factors that caused America to race ahead of other nations in electrical development and caused engineers and business men of those nations to come to this country to learn freely from American engineers and sales managers the secrets of electrical development which had here been uncovered and brought to full view.

Private Utilities and Municipal Plants

The first municipal plant was established in 1881. During a period when private capital was difficult to obtain, particularly in the smaller communities of America, to meet the impatient demands of the public for the benefits of electric service several thousand municipal power systems were installed. But in a relatively short time more than half of these sold out to private ownership and at the end of fifty years over 95 per cent of the power produced for public use in America was generated by the privately owned electric utilities, and over 90 per cent of the customers were served by them. The municipal utilities were tax exempt and enjoyed other subsidies, but this was not a sufficient advantage to offset the inherent advantages of private initiative, and so private enterprise far outstripped the field. Today after seven years of lavish Federal subsidy the private utilities are still producing 90 per cent of the power generated in the United States for public use, and they serve 88 per cent of the customers.

Future Prospects

I have been outlining the record of achievement of the electrical industry. But the public basically is little interested in the past. Its principal concern is with the present and with the future. It is what electric utilities have to offer for the future that attracts the public's sharp attention. One of the great weaknesses of established orders is that they content themselves with contemplating the accomplishments of the past; revering and praising things as they are. They tend to close their eyes to new avenues of usefulness, especially to radically different possibilities. The general public, however, particularly the new generation which takes for granted the things it found when it came here, soon wearies of much recital of past deeds and if those who have been leading the advance slow down, the new generation are soon treading on their heels and pressing to know what next.

The business that allows its engineering and development efforts to slack off and eases its practice of striving earnestly for improvement is in danger of losing its position in the forefront of advance and in being outdistanced in public esteem by other industries driving ahead. When the word goes forth to promising young men of ambition and ability from their closest advisers to steer clear of a particular industry because it offers no future, that industry has suffered a mortal blow. An army cannot rise above the calibre of its recruits. When men with creative talent seek other outlets for their abilities and efforts, those industries which attract such men will forge ahead. The one they avoid will drop behind. These are the ills that beset an industry that has its growth behind it. They are the reasons why no industry can afford to stand still, and must keep on striving to grow.

But what is the outlook for further electrical development? Are the possibilities approaching exhaustion, and is there really no great future ahead in this field?

Divorced from any political considerations, I am very confident that almost

without exception the best informed engineers would say that the latent possibilities of future development in the further harnessing of electricity are still there in great abundance. I venture to say that there were effected more valuable developments in the art of generating, transmitting, distributing and particularly in the art of utilizing electricity in the past 10 lean years than there were in the previous 10 fat years, and that there were more developments in the '20's than in the preceding decade.

What is the best means to insure that the world will some day enjoy the advantages of these electrical developments yet untapped to supply its needs, to stimulate its industrial and commercial development, to ease its burdens, to contribute to its health and its enjoyment?

The present policy of the national government is to look to government planning, supervision and direction, to look to government constructing and operating agencies, backed by huge government appropriations and subsidies at the expense of the national taxpayer, to provide this further development. The Federal Government has superimposed over existing state and local regulation overlapping Federal regulation to place narrow limitations on the exercise of managerial powers of private enterprise, extracting much of the initiative from that potent essence known as private initiative which has been such a powerful producer of good things in the past. Through short yardsticks and birchrods, it is enfeebling the hope of reward, that other potent producer in the past of good things now enjoyed; for it is the hope of profits which stimulates progress. When there is such prospect, demand for capital picks up, employment follows as the day follows the night. If this hope is shattered, there follows a shrinking of enterprise and a drying up of the opportunities. The chief reason for the collapse of the 1936-1937 prosperity and for the return of the depression was that these years did not generate a capital expansion movement which could have extended the period of active demand. As soon as consumers' needs were reasonably filled the period of prosperity terminated sharply. The same thing appears to be happening again and may be expected to recur so long as incentive is lacking for capital expansion.

The means for conducting public enterprise has always been derived from private enterprise. Public enterprise has scarcely any credit of its own apart from the power of taxation. Its political management, its inefficiency and its unproductive record have not inspired the assurance which will attract wary capital; and capital is the word for the aggregate of all the small savings of a vast number of thrifty people more than half of whom are women, who are placing great dependence on the few hundred dollars they have been able to accumulate through years of saving.

Under regulation which substantially usurps the functions of management, progress tends to stop and improvements, instead of being the usual thing, become rare occurrences. Regulation which destroys initiative stultifies progress. If exhausting explanations are required to obtain permission from diverse bureaucratic functionaries for each departure from accepted practice and if restrictions and limitations hedge the exercise of skill and genius, there is little chance of progress. Progress has been made by the process of trial and error. Advances have been brought about by following a correct but unproven idea, upsetting to previous practice. New developments are like the sprouts of a new-born plant, tender and easily destroyed by handling. Favorable soil and atmospheric conditions are essential until they grow to a hardier stage.

Public enterprise flourishes best when it serves only a small part of the whole economy and when there is ample and strong private enterprise to set the pace and to carry the burden it imposes without seriously slowing down the national economy. It offers few incentives and where there is no incentive the hazards of innovations are avoided. The pressure to sell additional service slacks off. The need for discarding old plant for bigger and the opportunity for discarding it for more efficient plant diminishes or disappears and the public finds itself getting along with the same old facilities and the same old methods year after year. Extensions of service, if made at all, are made as a result of election promises and political maneuvering in city councils or other legislative bodies. The more articulate and better organized voting elements get the attention.

Men of creative ability are ordinarily not attracted to its surroundings, but if they do land there, they find themselves in an atmosphere so unfavorable to creative developments as effectively to balk accomplishments. The creation of new developments and especially their practical application in the commercial world require greater effort, more capabilities, more ingenuity, greater freedom of decision and action, more willingness to assume risks than is ordinarily found in public agencies with their customs, their limitations and regulations and their lack of incentives.

When public enterprise launches into a field created and developed by private initiative it can draw upon personnel trained in private enterprise and can appropriate the best in materials and methods that private initiative has evolved, but when it has supplanted private enterprise the accelerating forces, the forces of further progress, are cut off. A heavy ship at sea when the engines are cut off will travel a considerable distance before it stops, but the forces of deceleration get the upper hand the moment the engines are cut off.

Under private ownership the monopoly which a business may enjoy, though it may have some legal support, depends primarily upon what it has to sell. Its compelling power rests on what it has to offer. When something more attractive comes along this compelling power vanishes. There is nothing to prevent any business or any person from producing his own electric power except the fact that he can buy it so much cheaper and better from an electric utility in practically all instances that he cannot afford to make his own. Government, if we are to judge from its oldest business enterprise, protects its business from competition with police and military powers, as anyone who reads the postal statutes can ascertain.

What a heavy price the world would have paid had Edison and his associates been fettered with the superimposed regulations now placed on the electric utilities! In their Herculean struggle to capture and subdue the forces of nature, the task took all they had to give for its accomplishment. If they had been handicapped in their efforts to finance their undertakings, it is almost certain that the world today would not be enjoying the electrical development it now has. The latent possibilities of further electrical development are still there without doubt, but is the public willing to afford the incentives which will bring to them this rich prize? These possibilities will not yield themselves to our yoke without the same tireless effort by the same type of able engineers that wrestled with and overcame the problems of the past.

The best way for the American public to cash in on the advantages of these

(*Continued on page* 88)

The 1940 Industrial Salesman

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UTILITY sales to Industrial customers in 1939 reached 50 billion kilowatt hours! For this service utility companies received over 600 million dollars! Who in the industry has been responsible for obtaining this business? And who has the responsibility of retaining and *even increasing* this important revenue? Of course—It is the utility Industrial Salesman.

Let's take a look at this superman and his opportunities and problems for 1940.

You will agree that the Industrial salesman must be a man of broad knowledge and sound viewpoint. And it matters not whether such qualities were gained in college, or through the process of self-education in the "school of hard knocks." The daily problems and experiences of the Industrial salesman constitute a liberal education in themselves, provided he is alert to the situation and takes fair advantage of all opportunities.

The problems encountered by the Industrial salesman include engineering and technical difficulties to be overcome; problems in economics, business judgment, contract law, human relations, and, most important of all—*Salesmanship.*

He is *primarily* a *Salesman*—a salesman of *high quality* and sound judgment, who is fitted by training, experience and breadth of vision to deal with business men of the highest type. Regardless of his technical and other educational qualifications, he appreciates the value of *continual training* in *modern salesmanship.*

The Industrial salesman's job is a creative one which calls for ingenuity and initiative. He is a planner—a self-starter. He must provide his own leads. Therefore, he *must* have a *"nose"* for *new business.* He must recognize new applications; engineer the job; lay out his sales strategy, and get the customer's name "on the dotted line."

The Industrial salesman has a sound basic knowledge of the utility industry and the historic background for the policies of his company. He knows more about such matters than his most experienced customer or prospect.

In addition, he has informed himself as to the business outlook of the industry of which his customer is a part, as well as the immediate business status and prospects of the customer with whom he is negotiating. This knowledge, which may not appear in the actual negotiation, furnishes the Industrial salesman with a solid foundation on which to carry out the sale.

It enables him to approach experienced buyers with confidence.

It furnishes him with many effective sales points.

It enables him to answer promptly questions which may be asked concerning his company and the utility industry.

It stimulates his enthusiasm, which is one of the essential qualifications of salesmanship.

The fundamental knowledge which the Industrial salesman has of his customer's industry and business enables him to talk his customer's language. He is equally "at home" with the shop foreman, the chief engineer, or the chief executive.

He is an able engineer, but his abilities along this line are only secondary to his abilities as a salesman. As one utility sales executive has put it:

"Engineers as a class are all too prone to submerge themselves in the technical aspects of a problem and sometimes lose sight of the fact that the technical solution is only the means to an end. Good business judgment and 'horse sense' play an important part in solving utility customer problems and this must be constantly kept in mind."

So much for the Industrial Salesman himself.

What does the year *1940* hold in the way of *opportunity* for the Industrial salesman? In *what respect* will 1940 be different from any other year?

Since the first of September, the daily press has carried practically nothing but news of the wars in Europe. Every business man, every industrial customer, asks himself the question, "What is this going to mean to *my* business? What is it going to mean to *me*?"

The press and national magazines have been flooded with articles, news and opinions by the best informed people telling what the war will mean to business in general and to specific industries in this country. Few *agree* in *detail,* but *all* agree in *principle* that the war will unleash powerful *social, economic* and *political forces,* the repercussions of which will be world-wide. Already certain lines of business have been stimulated and speculation has caused sharp price rise in some commodities.

In a year-end survey released to the press on December 25th, Harry L. Hopkins stated:

"During the year 1939 the trend of business was toward higher levels. In all sections of the economy—industry, trade and agriculture—1939 was a better year than 1938. This improvement has produced a more favorable background in which to consider and to appraise common problems of government and business—and a calm appraisal is a necessary prerequisite to intelligently guided action."

Biggs, Mohrman & Company, members of the New York Stock Exchange, canvassed one hundred *industrial* executives asking *their* opinion as to the probable level of industrial activity for the first quarter of 1940. From these opinions, Biggs, Mohrman concludes

". . . that while *seasonally adjusted indices* will show declines in the first quarter, *actual physical* volume of production will continue at a *high rate.* The outlook for the second quarter is somewhat obscure but generally favorable."

The December 15th issue of *Forbes Magazine* carried many articles pointing to *optimism* on the *part* of *business* and *industrial executives.* The Forbes poll, to which outstanding industrial economists contribute, indicates that these economists foresee only a slight slump in industrial activity for the first quarter of 1940 from the peak reached in the last quarter of 1939. This is far above the average for the same period last year.

Many economists and business analysts of national reputation, including Dr. Lionel D. Edie, Colonel Leonard P. Ayres of the Cleveland Trust Company, Standard Statistics, Inc., and many others, forecast that industrial production for 1940 will average 110 on the Federal Reserve Board's Index of Industrial Production, which is about 10 per cent better than 1939.

But what does all *this* mean to the 1940 *Industrial salesman?* It means that sales of Industrial customers' own products and services are on the increase.

It means that the customer's revenues and profits are rising—and they feel better—more optimistic as to the future.

For ten years Industrial management has deferred modernization programs, and held renewals and replacements to a minimum. Depreciation and obsolescence have taken their toll.

Better business for our Industrial customers and prospects means more opportunity for the Industrial salesman to sell more utility service because it:

Puts demands on old equipment which it cannot meet;
Brings to light relative inefficiency and inadequacy of present methods and machines when faster production is required, and, too;
It *provides* more *cash with which to carry out* PLANNED *plant modernization.*

Nineteen-forty should be an ideal time for the *Industrial salesman* to improve his company's position in the Industrial market.

Utility Industrial rates are decreasing relatively by standing still while commodity prices, including fuel and labor, are going up. This improves the competitive situation.

There will be the opportunity when renewing contracts to improve the company's position.

With improved customer load factor, the Industrial salesman can shape present load and new load in such a way as to improve his company's load factor.

Taken as a whole it can safely be said that the Industrial Market is becoming a more important source of *net revenue*. But Better Business will do little for *us* unless *we* do something about our opportunities.

The "Dismal Decade" of the "Terrible Thirties," like the "Roaring Twenties," has passed on and the *Industrial salesman* can look ahead with confidence that he can return to the fundamental principles of sound Utility Industrial Salesmanship.

First of all, to discuss the fundamentals of Utility Industrial Salesmanship, it is necessary to realize the basic functions of the *Industrial Salesmen's Job*. These include:

Holding present business;
Obtaining *profitable new business;*
Developing good customer relations.

To hold present business, the Industrial salesman should make frequent, scheduled, planned sales calls on his *present* customers and become acquainted with, and gain the confidence of, the executives, plant superintendent, foreman, key maintenance man, and all others interested in the purchase of electric service.

Through fundamental engineering principles, sound judgment, and helpful suggestions, the Industrial salesman should establish *himself* and *his company* as FIRST consultants on matters concerning the application and use of electricity.

To obtain profitable new business, the Industrial salesman has three broad markets to look to:

1. *Present Customers*

Present Industrial Customers can make so many uses of electricity that for the salesman to specialize on one or two, is to be unfair to the customer, and unprofitable to his company. Every Industrial customer can use additional applications—use present services more.

He must convince present Industrial customers that their present service is worth *more* than it is costing them and that they can use new and additional applications of service profitably.

2. *Present Prospects with "Home Made" Service*

He must make frequent, planned sales calls on present customers with competitive equipment and prospects with home power plants, and must be ever alert to take advantage of situations to be helpful to the customer in substituting utility service.

3. *New Industrial Plants*

He should scout out all possible prospects for new loads and get their contracts to use utility service, whether or not competitive salesmen are also working on the job.

In this connection it may not be out of order to put in a word of warning. Experience has shown that extreme care should be used in connection with large power negotiations, especially where substantial utility investment is involved, and particularly, if the investment can serve only the one customer and would be useless should this customer "fold up." With war demands causing expansion in many lines, the Industrial salesman should be careful not to cause his company to make long-term investments to serve short-term loads.

Good customer relations do not just happen, they are *earned*. In 1940 the Industrial salesman should merit and build good business relations by:

Continuing to render good, dependable service;
Continuing to sell his company's services at fair prices;
Using his knowledge of engineering principles and good business judgment to assist each customer to obtain maximum value from his use of utility service;
Recommending and selling—first those services which are most profitable to the customer, and by;
Recognizing that customer complaints are opportunities to render service to customers, and by following up such complaints, and settling them to the customer's satisfaction.

The job of building good relations is obviously not an easy one, but it is a vital part of any Industrial salesman's policy. Every business depends on friendly relations with its customers.

The Industrial salesman must fully appreciate the fact that he has a *valuable* service to sell. Because it is a *valuable* service, it is a *desirable* service from the customer's viewpoint.

Industry being stimulated by war demands, on top of a natural improvement in the business cycle, is calling for new tools and new plans as never before in its endeavor to improve quality, lower costs, and participate in the upturn in business. Utility Industrial Service admirably meets the need, because it:

Relieves industry of the burden of heavy capital investment;
Releases capital for profitable use in the business itself;
Relieves industry of the operating difficulties and troubles of power generation, and;
Provides a most efficient, economical and flexible source of energy supply.

In selling such utility Industrial services, it is essential that the Industrial salesman everlastingly:

Cite and re-cite the specific advantages;
Evaluate collateral advantages and savings in terms of dollars;
Have constructive suggestions for each customer call;
Use the fundamentals of salesmanship; and
Emphasize the *value, cheapness* and *use* of utility service as a means of insuring "profits" and long business "life expectancy" to the Industrial customer.

Successful selling on the part of the Industrial salesman in 1940 must be based on requisites such as the following:

He must be qualified, well trained, and confident.

He must be supplied with adequate sales records, handbooks, visualizers, check lists of applications of service, and so on.

He must obtain full and adequate, factual information on every phase of the operations and service requirements of each customer or prospect.

He must have adequate understanding of the principles motivating business men to make capital investment in their business and of the fact that the normal criterion for making such investments is their ability to "pay out" or return such capital in a short period of years—not in some long period or over the possible physical life of the equipment purchased.

He must know how to set up comparative costs and analyses so as to base annual charges on such investment recovery policies and not on physical depreciation of equipment.

He should be able to prepare a well written sales presentation at an early stage of each active negotiation, so that all of the facts and possibilities and their true relationship—as well as the full advantages and value of purchased utility service—may be available in concrete form:

For the *salesman himself* so he can talk clearly and confidently;
For his own superiors so they may have the facts and be able to help him; and
For all executives, consultants or other representatives of the customer, or prospect, who will have a part in making the decision to buy the utility's service.

But above all, the Industrial salesman must have a sincere desire to help his customer to do a better over-all job. He

should be interested not *only* in that phase of the customer's business which has to do with utility service, but also in anything that will mean better business to his customer in the long run. This sincere desire has got to come from within the salesman himself. It cannot be merely a thin veneer of "lip service." Unless it is real and comes straight from the heart, many opportunities for being helpful will escape his notice.

Study Salesmanship

The importance of studying Salesmanship cannot be over-emphasized to Industrial salesmen. This includes both new men and those veterans on the job. This study, to get the maximum results, must be a continuous process. This need for continuity of training is especially important in the utility business, characterized as it is by constant change, both as to industry and as to equipment utilizing utility Industrial service.

The technique of present-day selling is specialized; it is therefore a basic requirement that the Industrial salesman learn proper sales methods with respect to approaching customers, presenting and demonstrating the services they are promoting, and closing sales.

Salesmanship, in its essence, consists of overcoming obstacles when and as they are encountered—not retreating before them, and training is needed to enable the salesman to get consistent results successfully in the face of modern competition of all kinds.

Apply Salesmanship

The most important single function of utility Industrial salesmen, however, is the *application* of salesmanship—however he may have acquired his knowledge of the art.

In the application of salesmanship the frame of mind of the Industrial salesman himself is a determining factor. To be convincing, he must be enthusiastic and alert. It is fundamental that he himself be thoroughly sold on the *uses*, *value* and *cheapness* of the service which he is selling. It is important that he appreciate the full scope of his work both in general and as applied to specific sales negotiations. With respect to every individual negotiation, it is necessary, to get best results, that he work from the base of adequate facts, through a skillfully and attractively prepared sales presentation to signed contracts or customer agreements which will insure continued and increased use of the utility's Industrial services which he is selling.

To make Industrial sales calls constructive, it is a primary requisite that each individual call be made with a sales purpose in mind and thus be planned in advance.

A planned sales call is valuable to both the salesmen and the prospect. A call to discuss the weather, or to pass the time of day is serious from the standpoint of ineffective use of the salesman's time, but it is even more serious from the standpoint of the waste which it involves of the time of a busy prospect or customer.

A salesman's ability to direct an interview to a successful close depends to a considerable degree on how convincingly he can present, explain and back up his recommendations with facts. This being so, it is plain common sense for him to make sure in advance that he has his facts clearly in mind by reviewing them briefly just before making the call. Every salesman will find it profitable to develop this habit of the "ten minute think" and to review in advance of his calls, his procedure, his proposal, the points he wants to emphasize, and the facts he wishes to cite in support of his recommendations.

Written Sales Presentations

The written sales presentation represents a "package sale" and as such should be considered in the same manner as a packaged product. The opportunities to make the package and its contents attractive, and hence salable, are limited only by the imagination and the dictates of good taste. The important thing, of course, is to make it a well-thought-out array of sales points which the salesman has to sell.

It should be remembered that written sales presentations are not substitutes for personal, face-to-face salesmanship—they can only assist. They render valuable assistance obtainable in no other way, but the best that can be expected is to increase the effectiveness of personal sales effort.

George Weckel, in a paper presented to the Missouri Valley Electric Association in 1938, adequately covered the subject of "The Preparation and Use of Written Sales Presentations." As you will remember, he cited the experience of your member companies to prove their worth. So there is little need for me to dwell on this subject at this time.

A utility is by nature a one-price business, with prices set in accordance with the value of the service to the customer. It is not the function of the utility Industrial salesman to set the price of the service he is selling. His job is to sell service at the rates and prices set by the management, and convince the customer that the collateral values of the service make it worth more than the cost. Any tendency to resort to price cutting under fire during the actual sales negotiation is almost always a substitute for salesmanship. Experience has proven that price cutting often results from the fatal error of making a direct cost comparison between the full cost of utility service and the partial cost of an inferior quality substitute service, without taking into account the dollar value of the collateral advantages of utility service.

By and large, utility rates are set on the basis of the value of the service and the job of the sales department is to show the customer that the value exceeds the price. Unless utility rates are set to collect payment for the full value of utility Industrial services—including the value of its collateral advantages—the company is charging less than a fair price for the service it sells. If the latter situation were to exist, the need for the utility Industrial salesman would rightfully be expected to disappear, just as it would take little selling effort to move $10 shoes in competition with $3 ones if the former were marked down to the $3 level.

You well know the advantages of selective selling to develop the most profitable business requiring the lowest capital investment, and the Industrial salesman should follow selective selling methods even more closely in 1940. Every bit of Industrial business, both new and old, might well be examined carefully for its NET VALUE in 1940.

The desirability of securing a greater proportion of utility net revenues from the Industrial class of business precludes putting sales emphasis on business which is unprofitable. No utility today can afford to, or expect to, get all of the business in its territory regardless of profit considerations. It is entirely possible that there may be more profit in 90 per cent of the business at a fair price than in 100 per cent of the business at a lower price.

In this connection I was interested to note from Mr. W. H. Stueve's report that Industrial power in the Missouri Valley Electric Association's territory accounts for 5.1 per cent of the total revenue for only 4½ per cent of the total kilowatt hours sold throughout the country. You are evidently doing a very

good job in obtaining full value for your services sold.

It is readily apparent that selective selling can do much to produce greater net revenue from the Industrial class. The necessity for examining all Industrial business for its "Net Value" in 1940 cannot be too strongly emphasized. By seeking the most desirable business and by selling on the basis of *value* rather than *price* Industrial salesmen can best meet the challenge for more profitable business in 1940.

In summary, the utility Industrial salesman is a man of broad educational viewpoint and sound business judgment. His opportunities and responsibilities in 1940 are greater than they have been in many years past.

With the study and application of the fundamental principles of utility Industrial Salesmanship he will produce an ever increasing amount of *profits* for his customers and NET REVENUE for his company.

Appliances Determine Amount of Electricity Used

THE accompanying table, graphically illustrated by the chart, shows the growth of the consumer's investment in household electric appliances since 1924. This has been computed by adding together the total expenditures for new equipment, as reported by *Electrical Merchandising* and other trade papers, and subtracting, each year, the value of discarded appliances as estimated from tables covering average lives and average prices. It shows the net cumulative investment, *not* the cost of reproduction of the appliances in use at the current sales price.

The chart thus reflects the net effect of the growth in the number of customers, the increase in the appliances used per customer, and the change in the prices of the appliances themselves. The steady decline in the prices of several items, notably lamps, refrigerators and radios, which now cost about one-third of what they did 15 years ago, has served to offset to a large degree the increase in the number of appliances in service.

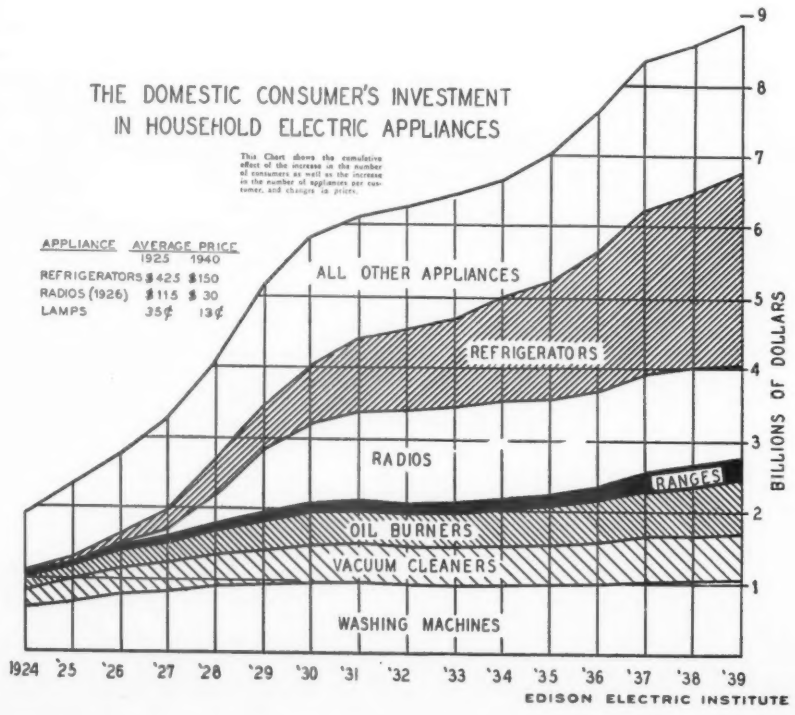
At the end of 1939, the average household had an investment of $362 in electric appliances (not including battery radios, wiring or lighting fixtures). The estimated annual mortality is 8 per cent, or $29. With this figure and assuming interest charges at 5 per cent of the investment, the domestic customer devoted last year the sum of $47 toward the fixed charges on his electric household equipment, which is more than $10 greater than his bill for the electricity which he uses to operate these appliances.

It is noteworthy that almost nine billion dollars are now invested by the consumer in household appliances. If the cost of wiring and lighting fixtures were added, it is evident that the total would be substantially in excess of the $13 billion dollars which represents the total fixed capital of all the electric utilities, public and private, in this country.—*W. M. Carpenter.*

CONSUMERS' INVESTMENT IN HOUSEHOLD ELECTRIC APPLIANCES AND ANNUAL USE OF ELECTRICITY

Year	Total on December 31st: Customers*	Investment Millions	Per Customer	Kwhr Used: Total (Millions)	Per $1 inv.	Annual Expenditures for New Equipment per Customer
1924	14,450	$1,950	$135.00	5,300	2.71	....
1925	15,600	2,350	150.50	6,000	2.55	$36.50
1926	16,825	2,800	166.50	6,950	2.48	38.50
1927	18,100	3,275	181.00	7,750	2.37	40.00
1928	19,250	4,050	210.50	8,725	2.15	55.00
1929	20,150	5,150	255.50	9,900	1.92	69.00
1930	20,525	5,825	283.75	11,150	1.92	50.50
1931	20,350	6,175	303.50	11,900	1.93	36.00
1932	19,850	6,250	315.00	12,050	1.93	23.50
1933	20,000	6,450	320.00	11,900	1.86	27.00
1934	20,600	6,650	323.00	12,825	1.93	31.50
1935	21,250	7,050	331.75	14,150	2.00	42.00
1936	22,025	7,600	345.00	15,900	2.09	54.25
1937	22,950	8,350	364.00	18,025	2.16	58.25
1938	23,525	8,575	364.50	19,850	2.31	34.25
1939	24,450	8,850	362.00	21,625	2.44	40.00

Note: *All residences and farms, excluding power used for irrigation pumping. This table does not include wiring and lighting fixtures, battery radio sets, flashlights, motor-driven work tools or special farm equipment.


THE DOMESTIC CONSUMER'S INVESTMENT IN HOUSEHOLD ELECTRIC APPLIANCES
This Chart shows the cumulative effect of the increase in the number of consumers as well as the increase in the number of appliances per customer, and changes in prices.
APPLIANCE AVERAGE PRICE 1925 1940
REFRIGERATORS $425 $150
RADIOS (1926) $115 $ 30
LAMPS 35¢ 13¢
ALL OTHER APPLIANCES
REFRIGERATORS
RADIOS
RANGES
OIL BURNERS
VACUUM CLEANERS
WASHING MACHINES
BILLIONS OF DOLLARS
1 2 3 4 5 6 7 8 9
1924 '25 '26 '27 '28 '29 '30 '31 '32 '33 '34 '35 '36 '37 '38 '39
EDISON ELECTRIC INSTITUTE

What's Next for 1940?

Looks Like Bombardment on All Fronts

By C. E. Greenwood

Commercial Director, Edison Electric Institute

SOMEONE has said that the modern home is the place where nothing can be accomplished if the current goes off. We in the utility industry wish there were millions more of this modern type. In the last issue of the E.E.I. BULLETIN the writer discussed briefly the American Home, very much qualified by reason of reference from the viewpoint of the standard of electrical living. Home life, the liberty to enjoy it and the battles to protect it have been the intense concern of intelligent people through the ages, and the themes of poets and authors. Just now American people are engrossed with reports of fiendish destruction of homes through bombardments of explosive shells in lands beyond the seas. There is a peaceful and harmless bombardment of homes going on in this country—a barrage of ideas for better living.

The strategic objective is Sales. The voice of business to sell starts in millions of impressions in National magazines; radio picks it up over many hours of the day; myriads of stores, and armies of sales people on the firing line, make these better living ideas express themselves in consumer buying. And thereon hangs the tale of millions of people in employment.

Mr. Gallup does not have a corner on the survey method of predicting coming events. Some may use still the crystal ball method, but the electrical industry has long adopted the sampling idea. Business surveys to find out what Mrs. Housewife will buy next. It makes a good game because "a wish is Father to the thought" and wishes result in sales *if* a humdinger marketing job is achieved.

Now it happens that in the din of the bombardment of the consumers by Business in general the voice of electricity has not been heard always in the market-place as strongly and as convincingly through National media and radio broadcast as others, nor over so long a period. But things have been looking up for the past few years and the possibilities that lie ahead command our enthusiasm. Granting that "we must run like Hell to stay where we are in performance records," the outlook for selling electrical energy to the residential market brightens because Consumer Benefits, through Electric Service, are greater than ever before. More Service for the same money is an entry on the asset side of the customer ledger. How we shall make it known and appreciated is a problem awaiting solution.

It has been repeatedly impressed that the cost of service has been gliding downward, but one more reference will not do any harm. As 1939 closed, the National average household rate was approximately 4¢ per kwhr. Then also comes signs of a downward trend in price for better grade products of utilization. Out of the welter of "price wars" and competitive selling will come a base of economically sound but lower prices to consumers. And have we not had recent encouragement in believing the third important factor in greater use of electrical energy—wiring costs—will show a similar trend to that of rates and products due to greater efficiency in production of materials and methods of application? Looks like a satisfactory base for further progress in our three-point attack on the consumer.

Let's refresh our minds on the market. At the close of 1939, the electric light and power industry was supplying 22,665,000 urban and non-farm homes with electric service, an increase of 555,000 over the 22,110,000 homes supplied in 1938. For the year 1939, the average use of electricity in these homes amounted to 890 kwhr, an increase of 45 kwhr or 5% over the use of 845 kwhr in 1938. This increase contributed to lowering the average revenue per kwhr from 4.21¢ in 1938 to 4.05¢ in 1939. The average annual bill for domestic consumer in 1939 was $36.05 as compared with $35.57 in 1938. It will be noted that the additional 45 kwhr use per customer coincided with an increase of but 48¢ in the annual bill. Some progress! We might say 'Well done thou good and faithful servant' of the people, but we must not rest content with that record under stress of present circumstances.

Next we might skim over some expansions that ocurred in markets. According to the Bureau of Labor Statistics, 1939 was the best year in the growth of new building in the last decade. Housing was provided for 343,084 families of which private sources accounted for 287,646. The other 55,438 families went into USHA projects, and this group enjoys the benefits of electric lighting, some have electric refrigeration, but comparatively few enjoy electric cooking. In addition to the Public Projects there were 27,917 families provided with housing in private projects of the multi-dwelling type. In addition these Federal records disclose that 238,029 went into new single homes and 17,534 into two-family structures.

It was pointed out in earlier paragraphs that there was an increase of 555,000 domestic customers connected to power lines in 1939, indicating that approximately 212,000 family units moved into shelters built in previous years. We may conclude that the new customers that moved into structures built by private investors had a generous total of electrical equipment installed. It is an all-industry job to sell the housewife electrical products which make utilization of energy possible. New homes, small and large, set the pace.

In another page of this issue Mr. W. M. Carpenter points out in a statistical analysis that on December 31, 1939, the householders of America had a total average investment of $362 per home in portable electrical equipment connected. Ponder the figures of a nine billion dollar investment, exclusive of lighting fixtures and wiring which would add another four billion.

Interest charges on this investment at 5%, plus an estimated mortality of 8%, amount to approximately $47 per household consumer. Compare this to the average annual bill for current of $36.05 and we arrive at an amazing

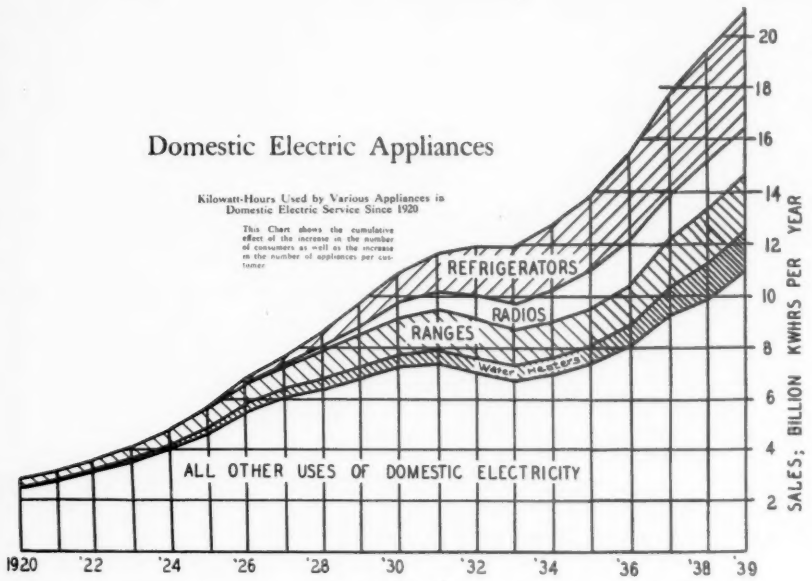


Fig. 1

fact that the total annual bill for electric service is approximately $11. less than just the fixed charges on the equipment for utilization. And yet this investment in equipment by the householder must be far more extensive if the utility is to gain any financial benefit.

An estimate of the annual energy output through the "best sellers" among the long list of household electric servants now installed is presented in Table I. Needless to say only an "estimate" can be prepared, but this tabulation will be found an effective guide for those interested in utility load development.

The USE factor of the major load builders is visualized in graphic form in Fig. I. Herein there is indicated growth of domestic output over two decades. The area representing "all other uses" includes energy output through two-score or more devices. In addition to the 10 additional appliances listed in the tabulation (Table I), one might include 10 more important items, for example—waffle irons, sandwich grills, hot water kettles, buffet warmers, fans and ventilating equipment, sun and infra-red lamps, hair dryers, razors and vibrators, all deserving mention through importance of service rendered. Then there are omitted such important devices as the dishwasher, floor polisher and a grist of other useful servants common to many of the homes of those in the higher income brackets, but of low saturation.

We can reasonably attribute the expansion of this Lighting and Miscellaneous Area during the past five years particularly to the rapid acceptance of roasters, oil burners, air-conditioning equipment, and sun lamps—in part. But above all lighting, which is common to every household, has been a feature of all utility promotion. The educational aspects of the Better Light for Better Sight movement have impressed millions of customers with the scientific facts of quality lighting essential for eyesight conservation with resultant sustained increase in kilowatthour use through lighting equipment.

In the study of the breakdown of current use, one classification of service gains our attention above all others. Over thirteen million electric refrigerators are ticking off approximately 20 per cent of domestic output. Our present load-building interest, and the burden of the theme of this discussion centers on the changed shape of the refrigeration "band" on the chart in question (Fig. I) at the close of 1940.

Considered estimates of refrigeration sales for 1940 indicate a substantial replacement market, perhaps 25 per cent, by new models using far less current, from which it is possible that approximately one billion kilowatthours may be clipped from the energy output through the replacement of last year's household

TABLE I—ENERGY USED BY DOMESTIC ELECTRIC APPLIANCES (a)
An Estimate for the Year 1939

Appliances	Number in Homes On Dec. 31, 1938 (1)	Number in Homes On Dec. 31, 1939 (2)	Saturation (3)	Average Number in Homes 1939 (4)	Kwhr per Year per Appliance in Normal Use (5)	Per Cent in Normal Use (6)	Effective Kwhr per year per Appliance (7)	Total Kwhr Used in 1939 (8)
Lighting & Miscellaneous uses	.....	.....	.....	(Per customer 317 kwhr)		..	....	7,460,000,000*
Refrigerators	12,250,000	13,775,000	57%	13,012,500	396	90	356	4,632,000,000
Ranges	1,975,000	2,235,000	9%	2,105,000	1,200	85	1,020	2,147,000,000
Radios & Phonographs	23,000,000	24,000,000	100%	23,500,000	100	80	80	1,880,000,000
Water heaters (all types)	610,000	694,250	3%	652,125	3,300	75	2,500	1,630,000,000
Flatirons	23,800,000	24,250,000	101%	24,025,000	80	80	64	1,538,000,000
Oil burners	1,525,000	1,725,000	7%	1,625,000	250	95	237½	386,000,000
Washing machines	11,250,000	11,750,000	49%	11,500,000	30	80	24	276,000,000
Vacuum cleaners	11,400,000	11,700,000	49%	11,550,000	24	85	20	231,000,000
Roasters	775,000	985,000	4%	880,000	300	75	225	198,000,000
Toasters	11,800,000	12,500,000	52%	12,150,000	30	50	15	182,000,000
Percolators	6,900,000	7,200,000	30%	7,050,000	50	50	25	176,000,000
Electric clocks	12,000,000	12,500,000	52%	12,250,000	15	95	14	172,000,000
Ironing machines	1,380,000	1,450,000	6%	1,415,000	125	80	100	142,000,000
Space heaters	4,950,000	5,100,000	21%	5,025,000	50	40	20	100,000,000
Total Appliances	.....	.....	.....	.....	....	..	....	13,690,000,000
Total Domestic Service	.....	.....	.....	(Per customer 900 kwhr)		..	....	21,150,000,000*

* Preliminary figures. (a) "Residential" plus "Farm" Service less Irrigation.

NOTES: Columns (1) and (2): Estimates largely from ratios shown in "Electrical Merchandising" and other trade papers: being based upon the summation of annual sales of appliances less an estimated replacement demand. Column (4): The arithmetical average of columns (1) and (2). Column (6): An estimate allowing for duplicate and unused appliances, houses unoccupied, summer cottages, vacation periods, etc. Column (7): The product of Columns (5) and (6) representing the actual kwhr per year per average appliance in the home. Column (8): The product of Column (4) and Column (7).

equipment. Normal growth must take up the slack if the domestic output curve of progress is to hold its direction. That objective may be gained by aiming our selling barrage of new low cost refrigerators at the lower income homes. Lighting kilowatthours must be increased beyond normal expectancy through more intensified educational work among consumers in Better Sight principles. We must up the quotas on ranges and water heaters. Most important is to pierce the line of resistance of installing more electrical equipment for the few hundred thousand families that will have new housing in coming months. How many of these families will start living electrically? Sales bombardments should continue on all fronts.

Is the time not opportune to develop a newer service that is just gaining a foothold in the residence field, but which offers greatest promise for picking up load losses of all kinds. Before the utility industry there lies one field for expansion which is about to have the big-gun attack—Packaged Air Conditioning.

There were approximately 20,000 of these portable units sold last year in the United States. It is a matter of conjecture what portion of these went into the home. It was a minor percentage, but the stage is now set as never before to approach electrical consumers with the benefits to be gained by air conditioning individual rooms for health and comfort. There is at hand factual data from authoritative sources in the medical field impressing the importance of filtering the air we breathe for better health and cooling it for comfort. Conditioning air makes it possible to keep windows closed and induce restful slumber by shutting out irritating noises.

Fortunately the portable devices for individual rooms which are small editions of the built-in plants with which everyone is familiar in theaters and stores, and which will bring certain of the advantages of such equipment, have been perfected for adequate service in the home. They are readily installed, and with careful application offer a service which will appeal to hundreds of those who can afford to buy. The window-sill type offers the greatest opportunity for a promotional barrage. People want to know about effectual electric services of this nature. How many afflicted with hay fever will applaud it!

In 1941 electric refrigeration replacement may be as high as 40 per cent, a cogent reason for planning promotional programs without delay. Three million users of packaged air conditioning would pick up the losses through replacement of refrigerators.

The market possibilities for this summer load merit study. How many bedrooms and living rooms in the upper bracket homes can be conditioned with portable units? The load possibilities are intriguing. Packaged air conditioning is the answer to "What's Next" to highlight in the residential field for 1940.

SEVENTH ANNUAL SALES CONFERENCE, E.E.I.

H. E. DEXTER, *Chairman*

Edgewater Beach Hotel, Chicago, Ill., March 20-22, 1940

SUBJECT PROGRAM

Wednesday Morning Session, March 20th

FASTER IN 'FORTY IS THE WATCHWORD

DEALER SALES—THE BOTTLE-NECK IN DISTRIBUTION

ADVERTISING MUST SELL USE

HOW TO SELL THE FARMER

Afternoon Session

NEW WIRING DEVELOPMENTS AID REWIRING COMMERCIAL BUILDINGS

THE REDEMPTION OF DARKNESS

RECENT LIGHTING DEVELOPMENTS EFFECTING LOAD GROWTH

PLAYLET—LIGHT BUILDS BUSINESS

Thursday Morning Session, March 21st

SOME POWER PROBLEMS FOR SOLUTION

KNOW YOUR INDUSTRIAL CUSTOMER

LOAD POTENTIALITIES THROUGH PACKAGED AIR CONDITIONING

SELLING LOAD TO SAFEGUARD NET REVENUE

Afternoon Session

EFFECTIVE COORDINATION IN UTILITY-MANUFACTURER SELLING

A LOCAL DEALER-COOPERATIVE PROGRAM THAT CLICKED

SUCCESSFUL SELLING IN THE RANGE-WATER HEATING FIELD

MEETING OBSTACLES IN BUILDING REFRIGERATION LOAD

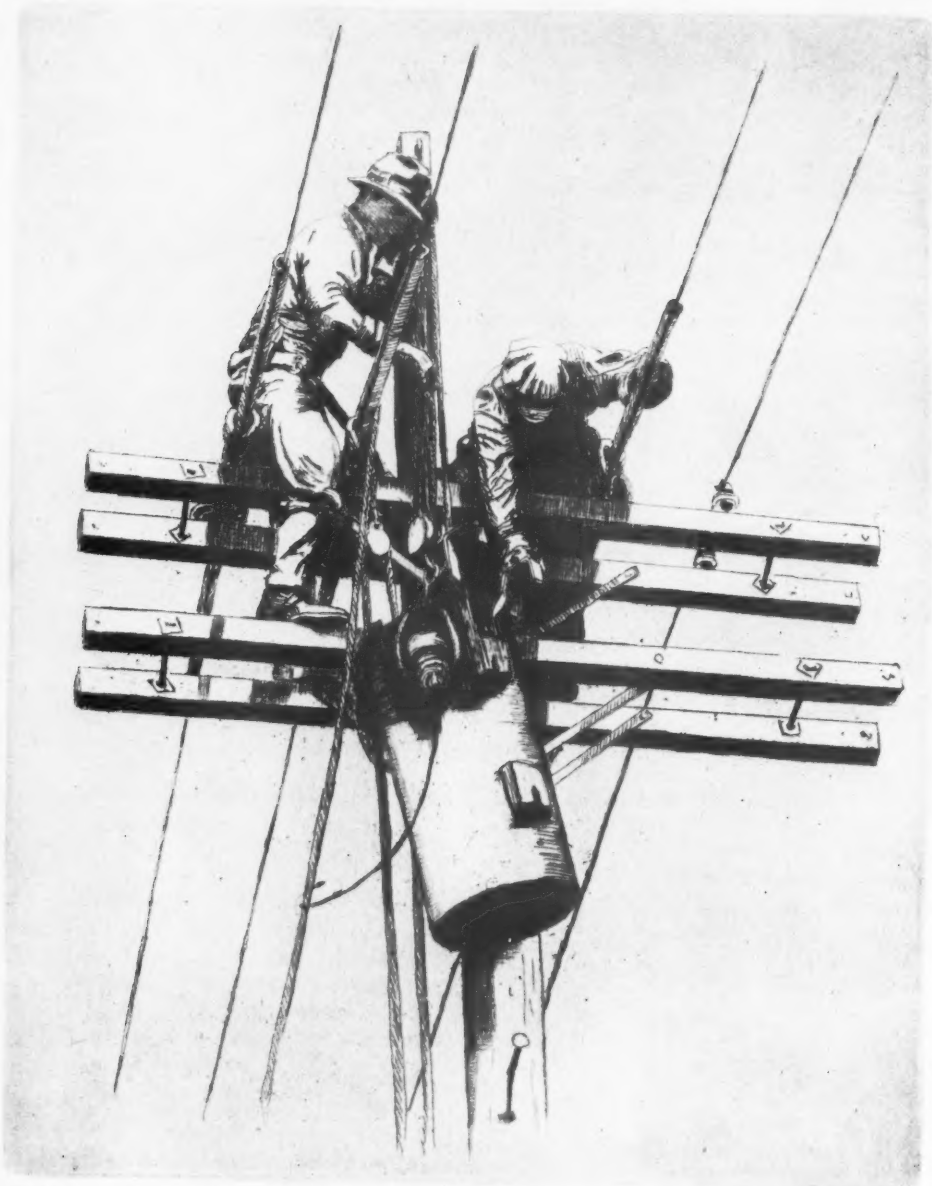
A feature of the Conference will be a dinner on Wednesday evening at which the Speakers will be Walter D. Fuller, President, Curtis Publishing Company, and C. W. Kellogg, President, E.E.I.

Tuesday morning preceding the General Sessions an Open Session of the Modern Kitchen Bureau will be held with W. H. Sammis, Commonwealth & Southern Corporation, Chairman of the Bureau, presiding.

On Friday morning following General Sessions an INDUSTRY CONFERENCE ON FLUORESCENT LIGHTING is scheduled.

The luncheon and afternoon session of the General Sales Committee is on Tuesday noon at one o'clock.

Authoritative speakers from Coast to Coast will be heard. This is a once-a-year opportunity for a rendezvous of commercial representatives of utilities and manufacturers.



Hanging A Pot

O Van Rye

Van Rye—Etcher of the Electric Utility Industry

THIS issue of the BULLETIN presents a selection from the etchings of Orie Van Rye of Boston, who has been justly styled the Rembrandt of the utility industry. Mr. Van Rye, Ass't Distribution Engineer for the New England Power Service Co., is an electrical engineer who has worked his way through the industry from the ground up. It was a good many years ago that he climbed his first pole; it has been barely five years since he submitted his first etchings of line crews at work to a salon jury. Those five years have brought him increasing recognition as an artist and interpreter of the men behind the light switch.

Probably the most dangerous obstacle to confront the artist who attempts to depict men at their jobs is the jealous pride of the worker in his trade. Even with his years of experience, Mr. Van Rye risked quite a lot when he exposed his work to the old-timer's critical inspection. However, as the etchings reproduced will prove beyond question, in this particular case such qualms were unfounded. The old-timer will see himself and his job presented here with intelligent understanding, and, most of all, with pride and affection.

Mr. Van Rye's medium and his subjects are happily mated. The difficult etching process depends for success upon artistic integrity and mechanical nicety. From the first etched line to the pulling of the final print from the press, there is no room for carelessness or shoddy workmanship. It would seem that this demanding technique is inherently sympathetic toward the delicate problems of balance and accuracy which the utility line crew take in its stride daily. The fiercely biting acid on hard resisting metal is the perfect medium to portray both the men and the structures of our industry.

His pictures are full of atmosphere and action. There is hard work, lusty laughter, good round cursing, sweat, heartbreaking aggravations and tremendous satisfaction, portrayed or implied. Of those reproduced in this issue perhaps the most effective emotionally is the one on page 43, "Line Patrol"—cold, driving wind, lowering skies, and through the knee-high drifts a figure beats its way doggedly, following the towers. Behind the impressive facade of the office buildings and the superhuman perfection of the dynamos, it is men like this guardian of the lines who form the flesh and blood of the industry. Men who are too apt to be forgotten in euphonious catchwords like "The Power Trust."

"Old Timer" shows you only his face, but in that glimpse you know the calloused palms, the broken nails, the sunscorched neck, the pride of craftsmanship, the will to see the job through. Here is the story of a life, told with a brevity and emphasis that is startling.

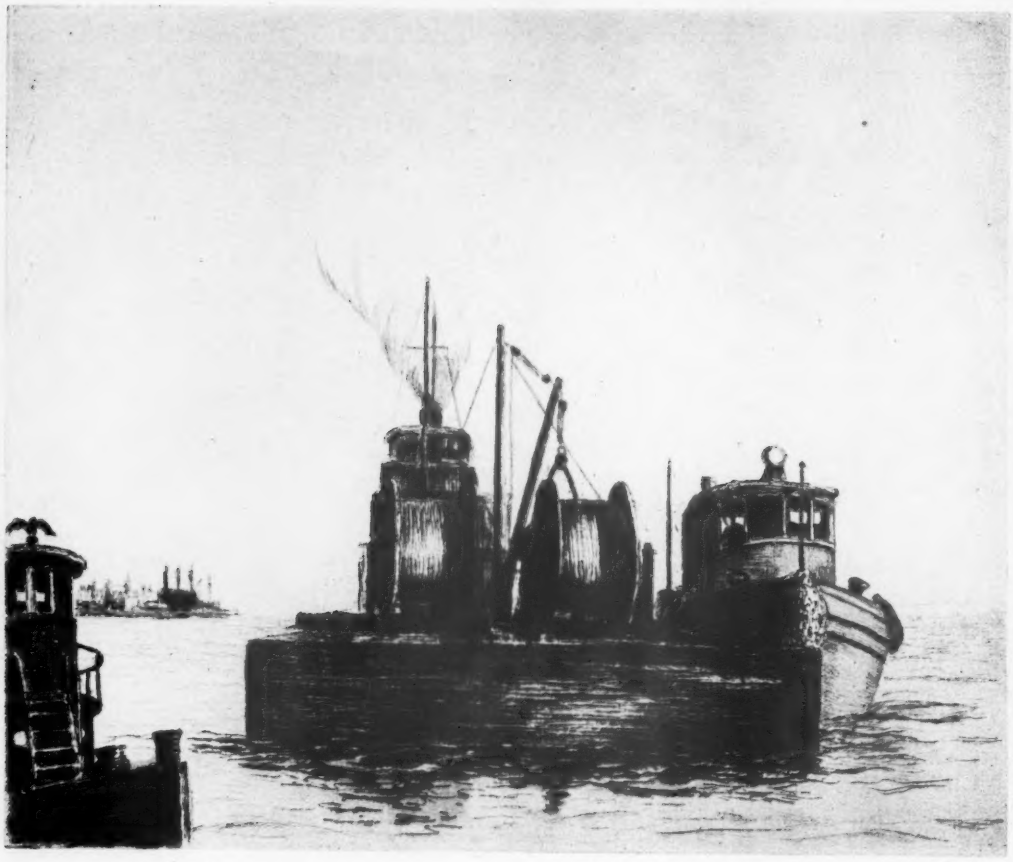
"Hanging a Pot" will be familiar to our readers. Sufficient to call attention to the composition and balance of planes, the sunlit effect and the swing of the figures. Fine drawing, this.

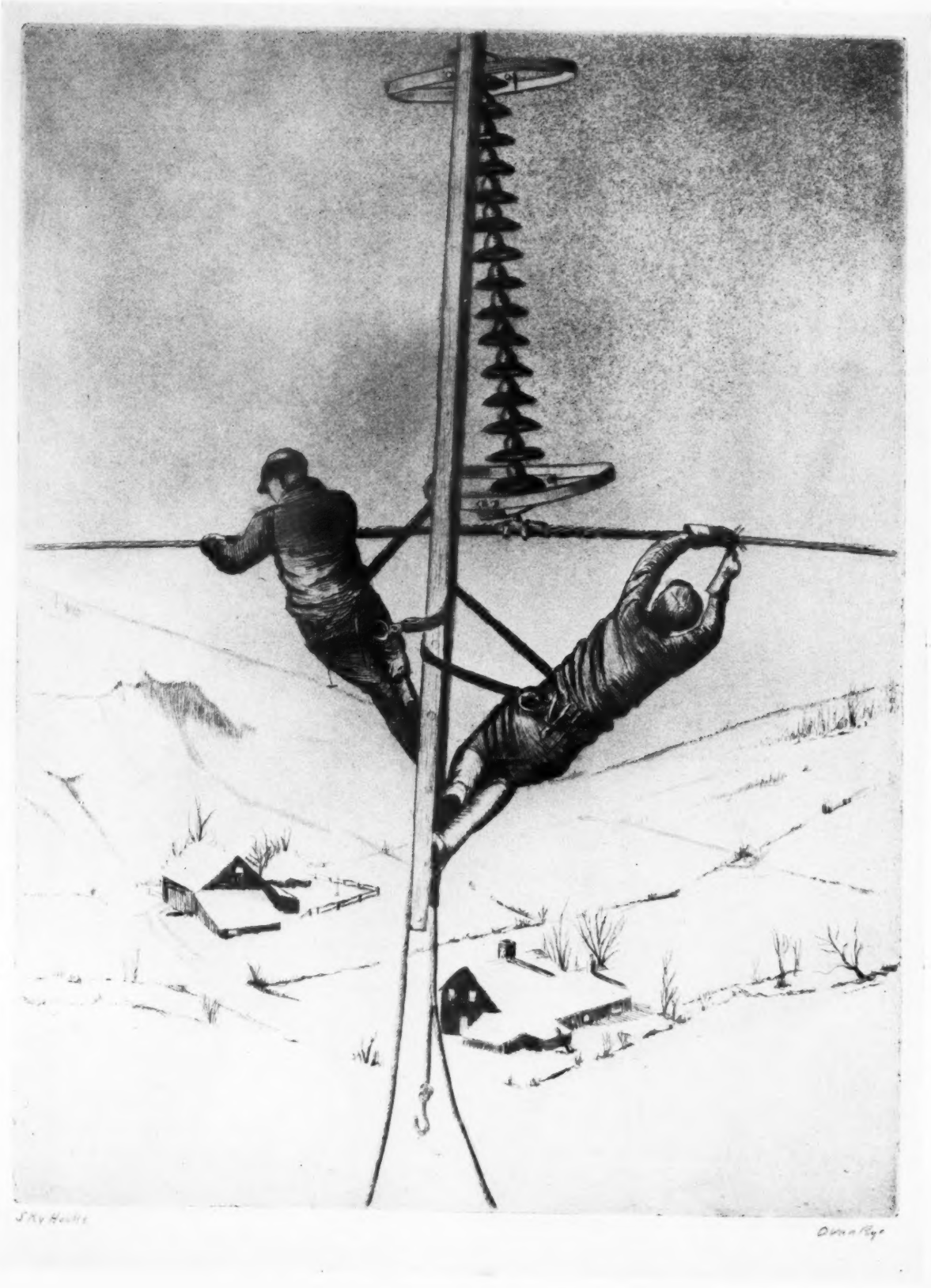
An entirely different mood shoulders out of "Submarine Cable." The airiness and vertical surge of the pole line pictures give way to snubby-nosed tug, blunt barge, hulking round cable reels, and, in the distance, the suggestion of more power in the three stacks on the shore. This was a gray day, with a slight fog on the water, but Van Rye saw these personalities and here they are, alive.

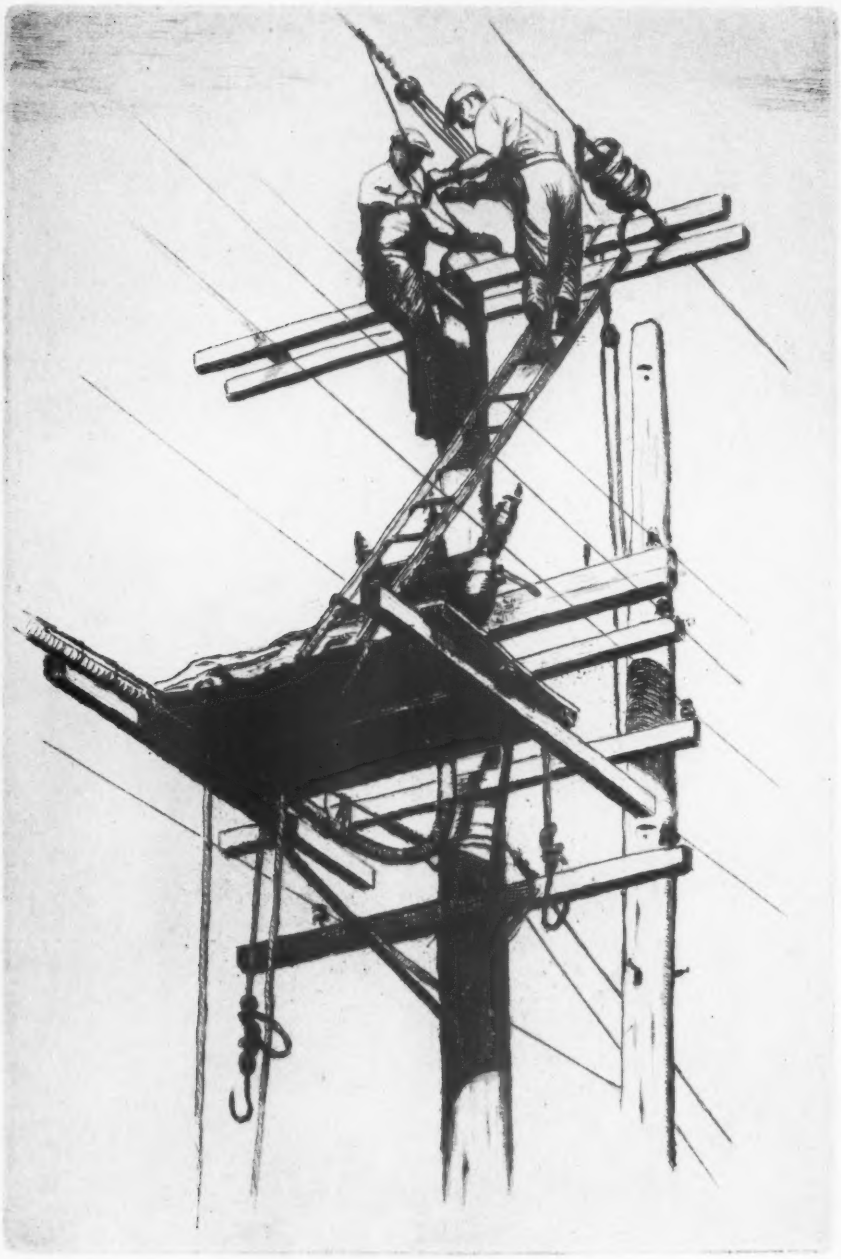
"Sky Hooks" is two pictures in one. Below, a snow-covered countryside, hedges and fields faintly distinguishable under drifts, houses and barns snugged in for the winter. Everything tight to the earth. Above, suspended from a ladder in apparent mid-air, two linemen repair a high-tension line soon to speed on to its tasks fleeting power from generators miles away.

"Reconstruction" shows a job ordinary enough to the lineman. Perhaps a flood has washed the lines down; or a hurricane, or even a heavy snowstorm. Or perhaps it is a simple job of replacing the old with the new. The linemen will fix it! And there will be no interruption of service if it is within the scope of human ingenuity to avoid it.

In these and other etchings of Van Rye, some of which have been reproduced in earlier editions of the BULLETIN, the linemen go about their jobs—tough, unassuming, somehow gallant. They are lucky in their portrayer and he is lucky in the linemen.—A. T. H.







Reconstruction

Development of Multiple Street Lighting System in Minneapolis, Minnesota

By D. M. Bunn and Harold G. Conant

Superintendent of Distribution, and Street Lighting Engineer, respectively, Northern States Power Company

Presented at a meeting of the Transmission and Distribution Committee, E. E. I., St. Louis, Mo., Feb. 5, 1940.

IN this paper the multiple street lighting system in Minneapolis will be described with the intent of presenting a comprehensive coverage of this phase of the subject, together with comments gained from years of operating experience. A brief history of its inception will be given, as it explains the circumstances which influenced the choice and development of a multiple system for general city street lighting. The main parts of the system comprising the control system, relays, supply circuits and luminaires will be described in order. The ornamental system will be dealt with more briefly as multiple circuits for this type of service are widely used and extensive operating experience is general. Some departures from common practice, however, will be noted. General operating practice and results that are peculiar to a multiple system will be mentioned.

Minneapolis, with a population of half a million, covers an area of nearly 59 square miles. Its platting is generally regular and in the greater part of its area its north and south avenues are 330 feet and its east and west streets are 660 feet apart. Such an arrangement is conducive to a simplified layout in street lighting circuits, either series or multiple.

At the end of the year 1922 the street lighting system consisted of an extensive installation of five-light ornamental posts (multiple system and largely patrol switched) in the loop district and secondary business streets, and about 5400 6.6 ampere series magnetite arc lamps, together with some small incandescent lamps inserted in the arc circuits for mid-block lighting. The remains of a gas lighting system existed, about 1100 gas lamps still being in service. The one hundred arc circuits were supplied from three substations and were generally fully loaded.

During the year 1922, the city decided to abandon the gas lights altogether and negotiated with the utility to furnish 550 additional arc lamps to replace them. The company was faced with a major problem to accomplish this, as the existing circuits were generally loaded, substation space was not available for new equipment and a heavy program was faced in cutting in new circuit capacity in the gas districts which, at the best, were already partially electric and not solid gas and which prevented clean rebuilding of new circuits.

It was felt that a multiple system of incandescent lighting would adequately fill the bill for this type of street light construction and by comparison would be very simple to install and operate. It, too, was foreseen at the outset that such a multiple system would be the simplest of all to expand, with no series circuits to continually cut and rearrange or start out poorly loaded to give room for expansion. Further, a survey of the distribution system at this time showed that it was able to accept the additional load with almost no need of transformer increase, as the individual transformers would take on only a small burden each. The City of Minneapolis agreed to accept an incandescent lamp of 1000 cp. in fixtures equipped with clear rippled globes and dome refractors as equivalent to a 6.6 ampere magnetite arc lamp, and the start of the extensive incandescent multiple street lighting system in Minneapolis came into being. As far as the writer knows, this system was the pioneer of large scale general multiple street lighting.

Since that time, the city has been more than pleased by the showing of these lights and the company has been amply justified in its decision. Years of ser-

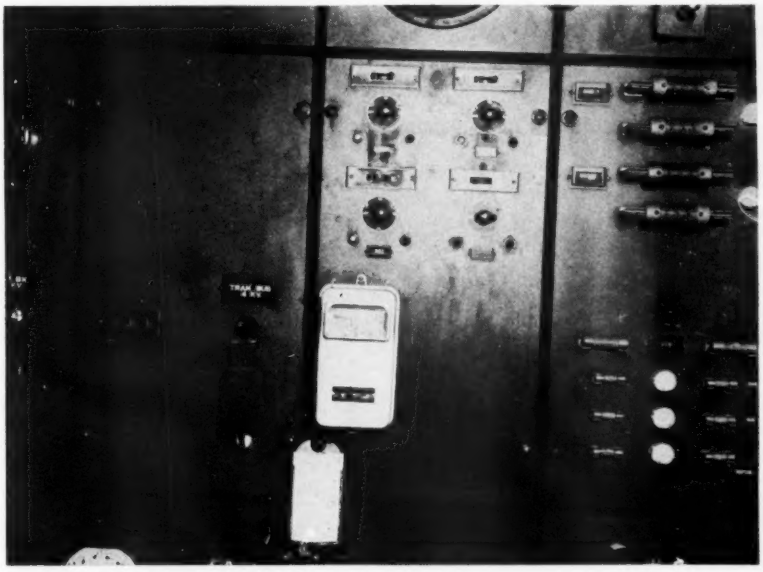


Fig. 1—Pilot Control Panel

Here is pictured the panel in Marshall Substation. Three pilots feed from this panel with equipment installed for a fourth circuit. The telechrone time switch is mounted on the face of the panel and the features mentioned are readily noted; individual circuit breakers, manual three position switch knobs, pilot lights and identification plates. Also, at lower left corner of panel is the month's schedule card furnished by the city.

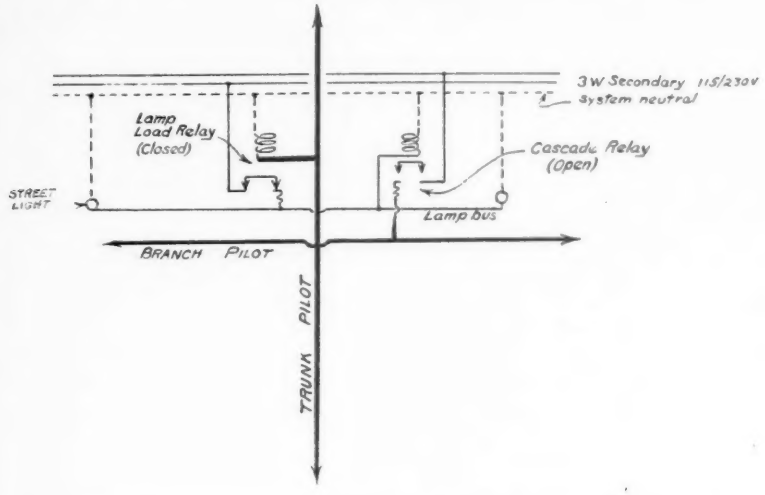


Fig. 2—Left, Pilot Cascade Circuit Diagram (Night Position)

Here is shown in one line diagram the circuit employed in cascading a branch from the trunk pilot. The position of switches indicates that the street lights are lighted. The trunk pilot is dead allowing the lamp relay to be closed livening the lamp bus which in turn is holding the cascade relay open causing the branch pilot to be dead the same as the trunk pilot. The day position reverses the operating position of the relays, livening the branch pilot from the secondary main. It will be noted that there is no electrical connection between the two pilots and troubles on the branch will be cared for by the cascade relay fuse (not shown) and cannot affect the trunk pilot.

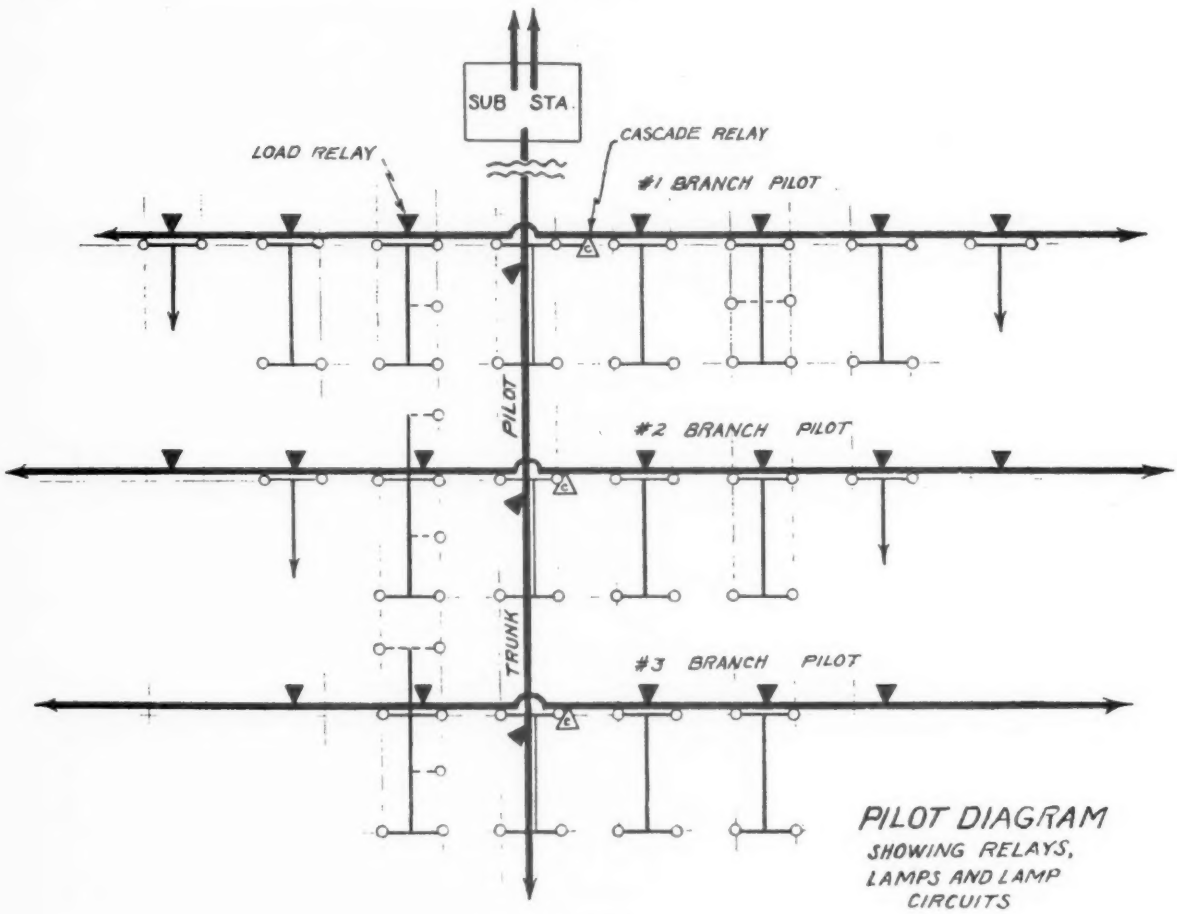


Fig. 3—Pilot Diagram

This illustrates the scheme of pilot coverage followed as closely as city platting will permit. The short, direct route of the trunk will be noted with the branches cascaded off at regular intervals. The standard forms of the supply circuits are also shown.

vice have shown an average outage of about 0.15 per cent of scheduled hours for the multiple system, as compared to 1.0 per cent for the arc lamps (the latter being an excellent record for this type of system) and it is hardly necessary to detail comparative costs of installation, operating, and depreciation. So favorable was the showing that in the following eight years all of the arc lights and their series circuits were retired from service. At the present time, the lighting system, exclusive of the ornamental post system and lights operated for the Park Board, consists of 3000 500-watt and 3174 300-watt pendant units with dome refractors and outer globes, 336 150-watt lights in radial wave reflector units and three multiple enclosed type 10,000 lumen sodium units. The use of this latter type of unit is expected to increase, their use to be confined to dangerous street intersections.

During the years that have intervened since the inception of this multiple system much has been learned from operating experience; refinements to promote reliability and ease of operation have been introduced, and the use of certain types of equipment has been abandoned. A description of the various parts of the system will be undertaken to present this phase of the subject.

The Control or Pilot System

It will be stated here that the pilot system of control was largely established before the advent of frequency control and no advantages from the latter type, if any, could be sufficient to warrant the retirement of this highly reliable system, so no discussion of carrier current control will be undertaken in this paper.

There are, of course, two systems of pilot control which can be utilized, a live pilot to close the relays for lighting the system, or a live pilot in the daytime to hold the relays open. After careful consideration, the latter type of control was chosen. If an interruption occurs, caused by break or grounding of the pilot, which is the most frequent type of fault, the trouble will be advertised in the daytime by burning lamps and can be located and repaired under daylight conditions; while if the trouble develops at night, no interruption of service will occur.

As originally installed, the station end of the pilots consisted of a simple panel with push-button switches, the operators turning the lights on and off manually. As now installed a more elaborate board is provided, but one that is still simple and inexpensive. The panel is equipped with a telechron motored time switch, creating a pilot bus, and each pilot is fed therefrom through a 15 ampere circuit breaker with green and red pilot lamps, so that the station operator is relieved of switching duties and can tell at a glance that everything is functioning properly. Ahead of each circuit breaker is a three-position switch so that each pilot can be manually switched to "On," "Off," and "Automatic" positions independently, should occasion arise. Control boards in operator-attended substations have an alarm which signals when a circuit breaker trips. Two or more pilots radiate from each substation and rather closely coincide with the distribution area served by the station. (Figure 1.)

In considering the pilots themselves, attention will be called to several details. Both the pilot circuits and the lamp supply circuits depend on the common neutral system, so that there is only one wire to consider in either part of the street lighting system. It has been our practice from the first to carry the pilot on an insulator spool lagged directly to the pole, except at corners, immediately under the rack carrying the secondary mains and above the single spool rack which carries the lamp supply circuit. This makes for quick and positive identification on the pole lines.

Our very early pilots were inclined to be long and not only was too much territory dependent on one circuit, but it was found that voltage on the pilot was an important consideration for successful relay operation. Though the relay coils are generally rated to operate on voltages as low as 80, we do not now allow pilot voltage to drop below 100 to 105 volts as sluggish operation was found to be damaging to switch contacts. This was first corrected by inserting special cascading relays in the main stems of the pilots, but this still left the outer portions dependent on the series functioning of the cascades and the long circuits ahead. When the systematic cutting over of series circuits was programmed, putting large solid areas of lighting under multiple operation, pilots were brought out of the station whose area was concerned. As now designed, a pilot consists of a main unbroken stem or trunk and branches are taken off of this trunk through cascades. A standard relay, controlling a group of lamps, is on the main trunk near a cascade point, a second standard relay is controlled by this lamp circuit and energizes the pilot branch from the local secondary main. By this system only standard normally closed relays are employed, a cascade failure affects only one branch, the main trunk of the pilot is continuous and lightly loaded, no cascades are in series, and the very important consideration is that the branch is electrically isolated from the trunk pilot and any trouble developing on the branch cannot be transmitted to the rest of the pilot. Pilot failures are thus isolated, automatically sectionalized and much easier to locate. The trunk portion of the pilot is comparatively short and follows main feeder routes. (Figures 2, 3.)

For further sectionalizing, to assist in the location of trouble, it has been found expedient to insert sectionalizing switches at strategic locations such as at junction points and the start of heavy tree exposures. Plug cut-outs, formerly used with distribution transformers, are used for this purpose and the saving of both time and the cutting and splicing of wire for trouble testing has resulted. Comprehensive maps of the street lighting system by substation areas are carried on each trouble rig with the cascades and sectionalizing points plainly shown, as well as all operating details necessary to operate the system. (Figure 4.)

With this type of pilot, control failures are held to a minimum and the street lighting system will give service nearly as fully as the distribution system can supply it even during or immediately after a crippling storm.

Relays

At present, there are in service in Minneapolis 1872 relays on the pilot system, 238 of which are double pole for use on heavy lamp groups or for ornamental post control. Lamp groups are arranged so that the single pole switches carry loads not to exceed 20 amperes.

Successful relay operation was found to be a problem requiring much experimentation, research, and experience. One of the first things learned was that thousands of operations satisfactorily passed in our laboratory, even with full loading, did not mean that the switch would not promptly fail under actual service conditions, as unexpected contact failures would develop under hours of continuous load carrying which would not show up in the make and break testing. Full voltage on the pilot was found also to be of the utmost importance to prevent contact damage in opening circuit. The use of springs in any way connected

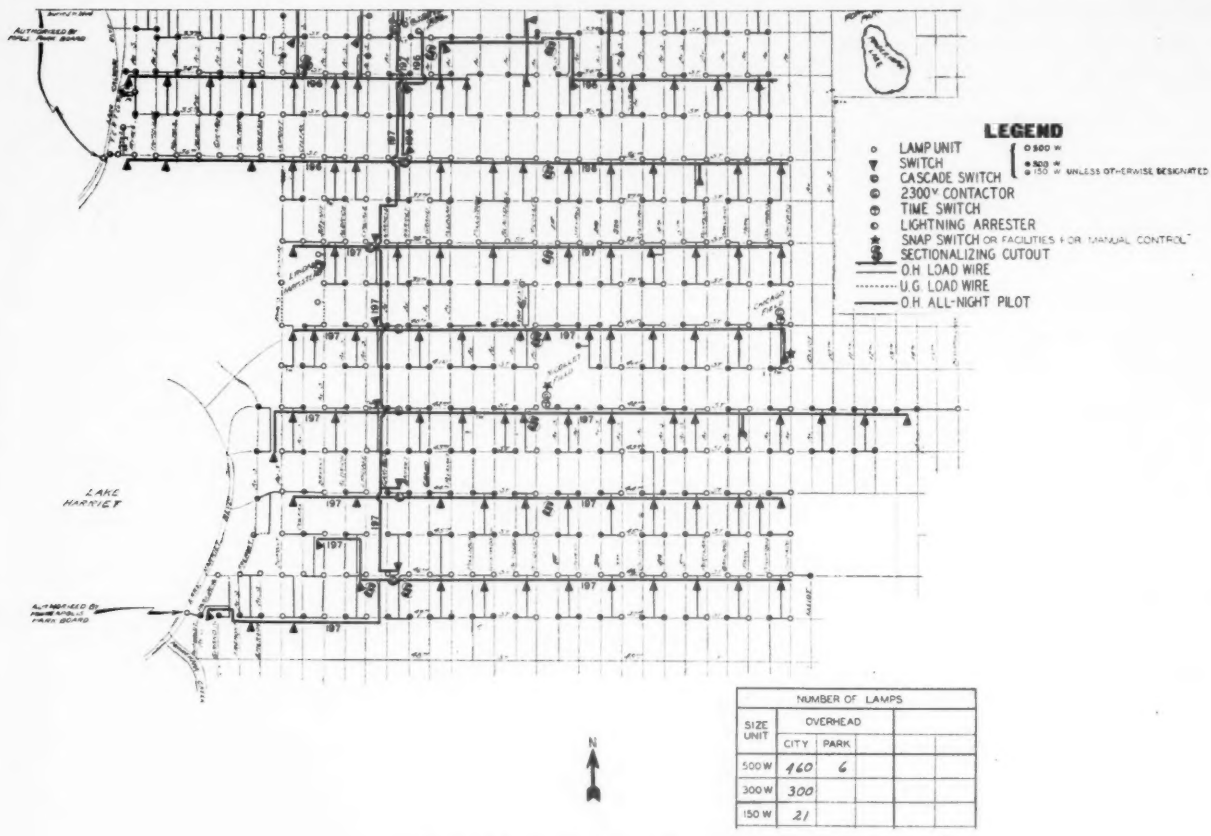


Fig. 4—Street Lighting Operating Map

Here is shown the south half (for clarity) of an actual operating map. One is prepared for each substation area. The top two branches are a part of pilot 196, south of that pilot 197 is shown in entirety. It will be noted that complete operating details are included for both pilot and supply systems including sectionalizing points, switch locations and lamp sizes.

with the contact mechanism was found to be totally unsatisfactory. A number of makes of this type have been experimented with and their history has always been the same; progressive heating of contacts causing annealing of springs which in turn causes increased contact heating and spring deterioration, a vicious circle that often ended in the total destruction of the switch, coil, mounting, and all.

Another type of switch which has been experimented with is two makes having a "V" or wedge-shaped contact and which gave promise of excellent performance, but which did not so prove in service due principally to excessive sticking of contacts causing failure to open circuit.

Noise in the relay is another condition which must be considered, as the 60-cycle hum of the solenoid parts may be in faulty designs, so loud as to cause complaint from residents in the vicinity of its installation.

The need for lightning protection was early found to be essential for coil protection. Our first experimentation was with carbon-mica telephone type arresters but they would fail in time, due to particles of carbon dust building up in the excessively small gap in the hole in the mica separator. At present, all of our switches are receiving satisfactory protection from a simple spark gap arrester with 1/32 inch gap of our own manufacture. Evidence indicates very frequent spilling and coil failures have been greatly reduced.

Three types of relays are now to be found on our system. One type employs two open concentric ring-shaped pools of mercury in a porcelain cup into which a metal bridge or spider drops, closing the circuit between the two pools. A solenoid lifts the spider to open the circuit. This switch was one of the earliest developed for this type of service and a large number are still in operation. If given light servicing and inspection once or twice a year, they are extremely reliable. Poorly housed and vulnerable, they suffer heavily from malicious breakage and are rather expensive from mercury usage. (Figure 5.)

Another type, both single and double pole, employs spherical butt contacts with a striking and rolling action in making contact. It is solenoid actuated and rated at 25 amperes per pole. This switch is largely used in our system. When its loading is limited to 20 amperes, which is somewhat under its rated capacity, it has proved exceedingly reliable. If the loading exceeds 20 amperes, its performance rapidly becomes poor due to heating, pitting and welding of contacts. (Figure 6.)

The third type of switch now in use on our system is of the tilting mercury tube type. The first ones employed gave some difficulty in solenoid sticking and breakdown of coils, both failures due to faulty design immediately corrected by the manufacturer on our suggestion. They now give excellent performance. Rated at 30 amperes per pole, they can carry their full rating with no distress

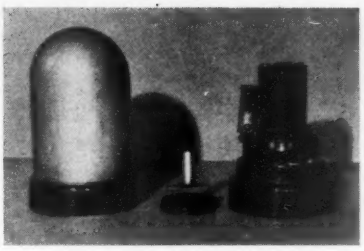


Fig. 5—Mercury Switch

The illustration shows the switch covered and opened. Two concentric ring shaped pools of mercury are contained in the porcelain base into which the iron spider, shown in center, is dropped by the solenoid coil. The lightning arrester is mounted on the side of the coil. Wires are taken off from binding posts under the base.

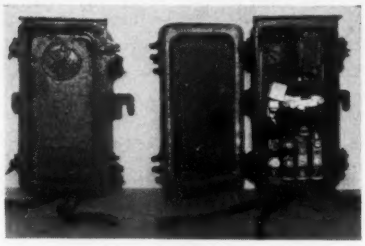


Fig. 6—Butt Contact Relay

The top contact is weighted causing a sharp strike when the solenoid drops it. The actual contact is spherical and a rolling action is permitted by the semi-jointed arm. The lightning arrester is mounted above the connection block, load fuse at extreme bottom left.

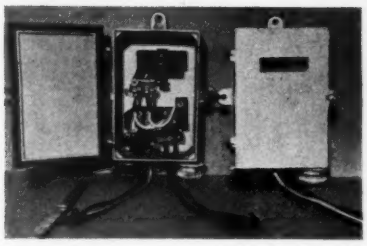


Fig. 7—Mercury Tube Switch

The tube is tilted upward by the solenoid to open circuit. Lightning arrester and choke coil in lower left, load fuse at right. Housed in cast aluminum case.

and are used especially where heavier loading must be carried. The combined operating record of these three types in the year 1938, with 725,495 switch days and 216 operating failures, gave the unbelievably low figure of .0298 of 1 per cent as their operating failure. These 216 operating faults were about equally divided between failure to light and failure to extinguish. (Figure 7.)

Switches are located on the poles eight feet from the ground, easily accessible for inspection or repairs and high enough to be generally safe from tampering. Formerly connected to the pole head with iron conduit and rubber-covered wire, the wiring now used is four-conductor weatherproof cable covered by wood moulding to meet A. T. & T. Company joint pole use specifications. (Figure 8.)

Supply Circuits

But brief mention need be made here concerning this part of the system. The platting of the City generally allows each unit of supply circuit to run the 660-foot length of the center line or alley of a rectangular block and feed the intersection lamps at the four corners together with lateral underground branches from the stem to the street, if mid-block lights are to be supplied. A single No. 6 wire is employed, carried on single spool racks for identification, the common neutral being used for return circuit. The relay supplying the circuit is located on or close to a distribution transformer pole so that the

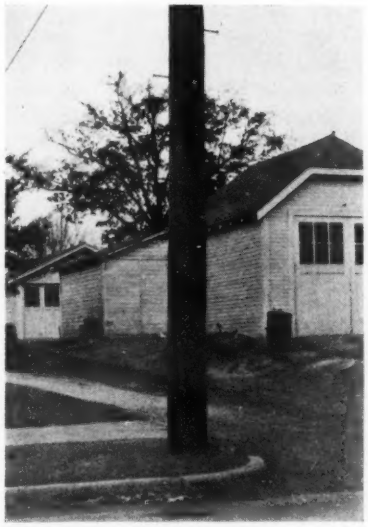


Fig. 8—Standard Relay Installation

The switch is mounted 8 feet above ground and connected to the pole head by 4 conductor weatherproof cable under wood moulding.

Fig. 9—20-Foot Mastarm Installation

In this case the mastarm is equipped with a multiple, orienting cutout instead of the standard safety end pulley and spreader arm. This equipment is used where it is necessary to have the unit lower vertically without the lead wires. Trolley span wires will be noted here as being the interference. Open telephone leads also require this type of lowering.

Fig. 10—Midblock Lamp Installation

Here is shown a typical 150 watt installation on a 12-foot mastarm for midblock service. The lamp is served from underground, the condulet of the riser being visible on the back of the pole. A 30-foot pole is employed, the mastarm being 22 feet above the street. The end fittings are interchangeable with the 20-foot arms. The underground circuit consists of a single conductor 600-volt cable of the non-inductive parkway type buried together with a weatherproof neutral wire.

secondary mains are but little involved. The primary system is regulated for approximately 118-volt transformer output and voltages delivered to street lights are within limits of 116 to 113 volts.

Luminaries

As stated earlier in this paper, lamp sizes in the overhead system in Minneapolis are confined to three sizes; namely—500 watt, 300 watt, and 150 watt. The 500-watt lamps are used at all street intersections in the densely populated area surrounding the down-town district and continuing on heavily traveled arteries and other important streets. The 300-watt units are used for street intersection lighting in the balance of the residential area and as mid-block lights on the heavy arteries. The 150-watt lamps are used principally for mid-block lighting on less important arteries and heavily shaded streets and some alley lighting, but not at street intersections.

The two larger sizes are used with enclosed luminaries equipped with symmetric dome refractors. They are mounted on 20-foot lattice type mastarms installed to give 28-foot mounting height to light center at street intersections and 26 feet for mid-block lamps. The 150-watt lamps are used in radial wave reflector units carried on 12-foot mastarms with light center 20 feet above the street. All of the above types are serviced by lowering the unit, and the cable for this purpose is fastened at the bottom end eight feet above the ground with a safety fastener which requires a special spanner wrench to release. This has very effectively curbed tampering. (Figures 9, 10.)

In the early days of the system, 20-ampere, 10,000-lumen and 15-ampere, 4000-lumen lamps were employed, operating from auto-transformers housed in the lighting fixture. The reason for this choice was that, at that time, the light output of a 500-watt lamp fell too far short of 10,000 lumens to be acceptable to the City in replacing arc lamps. Later, a considerable number of 6000-lumen lamps were added. The performance characteristics of series type lamps under constant potential proved very unsatisfactory as regards to continued light output and we were later required to interrupt their service after 2000 hours' burning. This characteristic of performance is now too widely understood to require discussion here. With later improvement in efficiency, the 500-watt lamp became a satisfactory substitute for the 10,000 lumen lamp and the City's contract was changed to use them and also to change the 400- and 600-cp. lamps to 300 watt; thus, utilizing two sizes of large lamps instead of three. A small but consistent gain in economy of operation resulted together with the lessening of the investment required for the compensators.

Fig. 11—Standard 20-Foot Mastarm Installation

Attention is called to the pole lead arrangement. Single phase primary is carried on the pole top pin. The next three wires are the secondary main, one of them being the system neutral, next the pilot on a spool lagged to the pole and lastly, the bottom wire is the street light supply wire. Trees need to be trimmed but a minimum for clearance and the general neatness and inconspicuousness of the line may be noted.

In recent time, we have abandoned the use of standard wattage lamps and are using 1500-hour special street lighting lamps of 527, 316, and 157 watts, respectively, with a comparative reduction in renewals and outages.

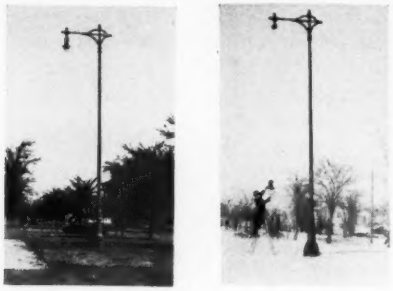
While this has not been designed to be other than a descriptive paper on the subject of the Minneapolis multiple street lighting system and not controversial, certain outstanding advantages have been accomplished that deserve passing mention. Congestion on pole lines has been unbelievably reduced, particularly approaching substations supplying street lighting. A pole line leaving one substation, as an example, had six decks of series circuits while today it carries three street lighting *wires;* i. e., two pilots and the local supply wire. Of course, it is realized that a modern series system with remote controlled transformers is not comparable with such a condition. Crossarms have been removed to a large extent from the pole lines, the only ones needed being on distribution lines where more than one phase of primary is present. This has done much to improve the appearance of pole lines on city streets by making them less conspicuous and has had its effect in public relations. Also, the ability to use a vertical wire arrangement on a much larger percentage of poles than would be possible with series circuits, has greatly simplified trimming of boulevard trees as a much narrower path is needed for clearance. (Figure 11.) The amount of wire required for the street lighting system has been reduced to a minimum, amounting to about 70 per cent of the footage required for the most favorable routing of a modern series system over the same area. No voltage above 115 volts appears in the entire street lighting system, representing a large forward step

Fig. 12—Twin Unit Standards

A night view of Nicollet Avenue, the main retail street. 750-watt lamps are used. Every alternate post carries the street side unit all night, the balance of the lights going out at midnight. Height to light center is 23 feet.

Fig. 13—Parkway Ornamental Installation

Illustrated is a portion of the 230/460 volt multiple installation of ornamental posts on Minnehaha Parkway. A similar line of posts on the other side of the 75-foot center island lights the east-bound roadway.



Figs. 14 and 15—Playground Standard

Similar to the parkway standards except considerably higher. Because of their location on park lawns they are inaccessible to vehicles of any kind so unusual provisions for trimming were devised. A special lamp unit was developed, the upper half containing the pulley and cutout, the bottom half lowering for servicing. The second pulley is incorporated in the arm. A chain is used instead of cable to be less conspicuous. A standard safety lock fastens the lower end; by this construction the unit is serviced without the aid of a tower or ladder truck. Right figure shows unit lowered for servicing.

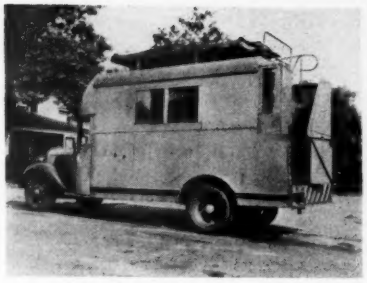


Fig. 16—Tower Truck

With platform down and railings folded, this vehicle will pass under an 11-foot clearance. The platform rises to 25 feet by a three lift hydraulic piston, the elevator being controlled from the platform. In the cab and under the stairs generous locker space for maintenance supplies is provided. The whole cab is heated and equipped with a sink with running water and drain board giving complete facilities for globe washing summer and winter.

in safety. While it is admitted that linemen are used to working series circuit voltages, their work is largely in the daytime and it is the troubleman, working in the darkness of night on series circuits, generally under wet and stormy conditions, who gains the greatest benefit of safety.

The Minneapolis multiple system is able to utilize the system neutral to a maximum amount, completely avoiding duplication of wire for return. Our experience with series circuits of 30 kw capacity, when attempting to use the system neutral for a return, was very unsatisfactory. Too great a stress to ground was impressed on the hangers at the head end of the circuit, causing frequent breakdowns to the grounded mast-arms in wet weather. Tree trouble also was greatly aggravated and reliability of the circuit was seriously impaired.

Mention, too, should be made of the ease of expansion of the system amounting only to simple extensions of pilot circuits, supply circuits, or both. No complicated processes comparable to cutting series circuits to make three circuits of two or of having parallels of wire of more than one circuit in the same territory are encountered, conditions hard to permanently avoid if the series circuits are not originally established grossly underloaded.

The description of the overhead portion of the Minneapolis multiple system will be closed by the following general summary:

Lights

There are 6174 500-watt and 300-watt pendant units, supplemented by 336 150-watt lights or a total of 6510 lamps.

Control

These lights are controlled by 31 single wire, 115-volt pilot circuits originating from 12 substations, totaling 248 miles of wire and operating 1623 relays to supply the lamp groups in the overhead system.

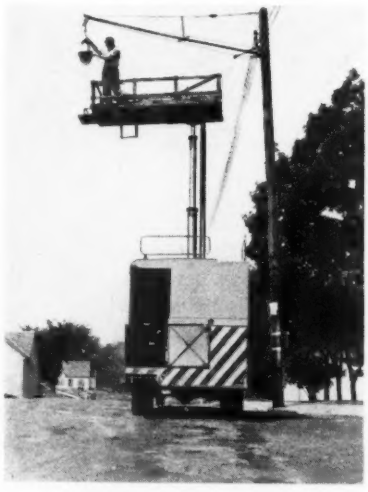


Fig. 17—Tower Truck

Rear view showing platform elevated and rotated giving maximum traffic clearance on street. When the platform is rotated toward curb ornamental posts can be reached over parked cars.

Supply Circuits

There are 467 miles of No. 6 wire in the supply circuits of which 100 miles is neutral wire used only for street lighting purposes.

Summary

6510 Lamps controlled by an average of 200 feet of pilot per lamp.

6510 Lamps supplied by an average of 372 feet of supply and neutral per lamp or a total requirement of 572 feet of wire per lamp. Average lamp spacing is considered at 475 feet.

6510 Lamps controlled by 1623 relays or about four lamps per relay.

Ornamental Post System

The second phase of this description concerns the ornamental post system. This portion will be limited except as construction has varied from common practice. The ornamentals are divided into two groups; those in service for the Street Lighting Department and those in service for the Park Board.

In the first group are approximately 1600 posts of several types and candlepower in operation on the business streets and various bridges. Of this number, but

582 belong to the utility, the others were installed and owned by the City but the Company supplies and owns the control pilots and relays for the entire system and operates it.

A large installation of this group on the main downtown streets is twin-light 750-watt posts. They are controlled by 100- and 200-ampere contactors on a four-wire three-phase system, two phases midnight and one phase all night, the circuits where complete being a closed loop around the block with one service point. In addition to the two luminaires on each post, a convenience outlet is provided at the upper part connected to the midnight circuits for use in special decorative lighting, a facility used during the holiday season every year and for major conventions to the extent of about 1½ kw per post or 3 kw per stringer. Another feature is the looping of the pilots through the base of the nearest post to the feed point with a key switch so that the group may be lighted for testing or servicing without having to gain access to the service cabinet in a vault or basement. (Figure 12.)

In the second group, that is the posts operated for the Park Board, 422 posts located in parks and on parkways are owned by the Board of Park Commissioners.

A large part of the Park Board-owned posts were installed on two major parkways in 1927 and a unique departure from common multiple practice was used. The customary three-wire multiple circuit was employed, but the available feed points being long distances apart, a voltage of 230/460 was employed. It is fed from 230/460 volt distribution type transformers controlled from the adjacent overhead street lighting with conventional primary contactors. The lamps are 600 cp. fed from compensators with a 230 volt instead of 115-volt primary winding. In the case of a similar installation under the jurisdiction of the City Street Lighting Department, these compensators were rewound at a cost of about $1.50 each in the Company shops to 2/1 transformers and 300-watt lamps substituted for contract reasons. This system may be considered a hybrid between multiple and series, but its operation has been very satisfactory and the advantage of using low voltage cable together with the reliability of a multiple circuit has been retained. (Figure 13.)

The second departure from our standard multiple practice concerns certain parks where a large number of lights are concentrated in a restricted area. Here the posts are fed from a standard distribution type transformer controlled on the primary side from the general street lighting. Such an installation can be considered about on a par with a similar series installation, its principle advantage in our case being that it does not cause a mixture of operating procedures and parts. (Figures 14 and 15.)

To summarize the ornamental control system as a whole, we will state that it is controlled by 24 miles of overhead and 11 miles of underground pilot, separate all night and midnight pilots being employed, operating with 256 relays. The Park Board ornamentals, being in the midst of the general overhead system, are not charged with any pilot wire but have 20 primary contactors.

In closing, passing mention will be made concerning operating procedure. At night three men patrol the overhead system for the removal of lamps and glassware and to start relays when necessary. The infrequent outages caused by line trouble are called in by them to the general trouble board. In addition, a tower truck covers the main ornamental system for renewals and minor repairs and, if time allows, finishes the shift with globe washing.

In the day shift, the tower truck is employed in general servicing, both overhead and ornamental, painting washing, cable, and lead renewals and fixture installing and changing. This vehicle thus works two shifts a day. A light rig cares for switch servicing and replacements, renewals and miscellaneous work both in the City and suburban. Major repairs are made with the construction crews. (Figures 16 and 17.)

Of interest concerning items peculiar to a multiple system, the following information is given covering the past year: *Lamp Renewals.* 2.59 527-watt 1500-hour lamps were used per unit, giving 1480 hours average life. An accurate check on 300-watt lamps cannot be given as a considerable number of standard 1000-hour lamps were used during part of this period. Labor and transportation costs for night inspection and renewing were $1.39 per lamp per year. *Relays.* The annual cost of repairing and inspecting relays and replacing as necessary approximates $0.75 per lamp. The average age of the relays in the Minneapolis system is, at least, 10 years. *Globe and Refractor Renewals.* This item together with cleaning, fixture and suspension maintenance is, of course, common in cost to both series and multiple systems.

The 1938 annual operating report shows, in the general overhead system, an outage based on lamp hours out to lamp hours scheduled of 0.16 per cent. This bears out the statement that great reliability has been the outstanding experience of many years of operation which together with flexibility, ease of expansion and safety of operation has justified the choice of this type of street lighting system since its inception 17 years ago.

A. H. Markwart

ARTHUR H. MARKWART, vice-president in charge of engineering of the Pacific Gas and Electric Company, San Francisco, died on Jan. 25 at his home in Piedmont after an illness of three months.

The record of Mr. Markwart's career is an inspiring chronicle of one who began life as a poor boy and climbed to high places in several fields. He won fame as a consulting engineer. From 1912 to 1915 he was chief of construction of the Panama Pacific International Exposition. As an officer of the P. G. and E. for the past twenty years, he had a major role in the planning and building of many of its largest electric projects, including those on the Pit and Mokelumne Rivers. He was a widely recognized authority on the economics and engineering practices of power development. And he was a director of several business enterprises and civic organizations.

Mr. Markwart was born in Illinois in 1880 and in his childhood was brought to San Francisco by his widowed mother. He worked his way through school and The University of California, where he was graduated in 1903 as a civil engineer.

For nine years after leaving college he was a consulting engineer in partnership with John D. Galloway. Then came his service with the Panama Pacific International Exposition and at its conclusion he returned to private practice. He joined the P. G. and E. in 1920 and became a vice-president two years later.

Mr. Markwart was a director of the Russ Building Company, the North American Investment Company, the Commonwealth Investment Company and the San Francisco Remedial Loan Association and president of the California School of Mechanical Arts, which he attended in his youth.

Twelve Resuscitation Medals Awarded Last Year

Total Number of Electric Utility Employees to Be Honored for Life Saving Reaches 504

By Mae B. Woods

Secretary, Committee of Judges, Edison Electric Institute Medal

AN impressive number of lives saved through the knowledge and practice of the Schafer Prone Pressure Method of Resuscitation by employees of electric light and power companies is annually recorded in the announcements of awards of the Edison Medal for Resuscitation. The total number of officially certified cases of resuscitation in the electric light and power industry alone has reached 504. Four hundred fourteen of these cases were memoralized by the National Electric Light Association through award of the Insull Medal for Resuscitation.

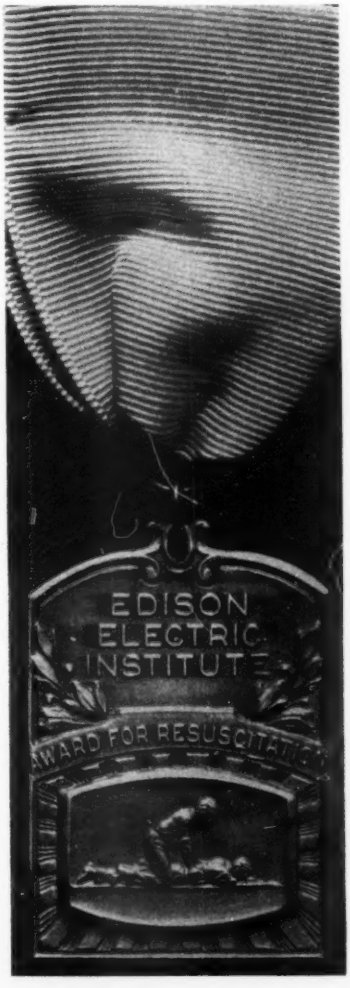
Ninety awards of the Edison Medal have been made since its establishment in 1933, 12 of them being presented to employees or groups of employees of light and power companies during 1939.

The Edison Electric Institute Medal for Resuscitation was designed to commemorate the performance of the act of resuscitation and to encourage and maintain interest in the widest possible training of utility employees in the use of the Prone Pressure Method. The medal was established by the Board of Trustees shortly after the Institute was organized in 1933 and presentation was originally restricted to employees of member companies who successfully resuscitated individuals suffering from electric shock. Recently the terms governing the awards were broadened to apply to employees of all light and power companies regardless of membership in the Institute.

Further liberalization of the conditions governing bestowal of the medal are indicated in a statement from Mr. Wills Maclachlan, chairman of the Committee of Judges for the Medal, who advises:

"Based upon the well known fact that if resuscitation is started with as short a space of time as possible, between the shock and the application of artificial respiration, there is more chance of bringing the victim back to normal breathing after an electrical shock, various methods over a number of years have been used, to endeavor to apply some type of artificial respiration to a man who has received a shock while working on a pole.

"The late Doctor Holtz of the Duquesne Light Company, investigated this matter quite thoroughly some 10 years ago and more recently other officers of the Duquesne Light Company have developed the method known as Pole Top Resuscitation. Some cases in which artificial respiration was started on the pole and finished on the ground, have been referred to the Medal Judges for consideration and in cases where the situation warranted, medals have been awarded. Some other cases have been presented in which artificial respiration was started and completed on the pole and medals have been awarded.



"The basis for the award of the medal is that a man's life was saved and fundamentally the physiology of the artificial respiration, so carried out is essentially based upon the work of Sir Edward Sharpey-Schafer. The Committee of Judges is carefully watching this situation and should the occasion warrant it, recommendations will be put forward for modification, if necessary, of the Regulations."

A certificate describing the act of resuscitation, signed by the President of the Institute, is presented with each medal. In cases where a medal has been awarded, a Certificate of Assistance is also presented to those who have rendered valuable aid in resuscitation. Miniature medals and certificates are also given to members of line crews who have participated in cases of successful resuscitation.

In addition to their significance as well-merited tokens of humanitarian accomplishment, the medals have a definite historical value since they have in their composition copper from the original mains laid down in New York City by the late Thomas A. Edison. This copper was part of the first underground distribution system in the world for supplying current for electric light and power.

The recipients of the medals awarded in 1939 and brief statements of the circumstances leading to their award appear on the following pages.

John Henry McCabe is presented the Edison Medal by C. L. Campbell, President, The Connecticut Light and Power Company.

M. E. Shotwell receiving Medal and certificate from Gen. Supt. R. B. King of Idaho Power Company.

JOHN HENRY McCABE

Connecticut

On July 20, 1938, Robert Raytkwich, an employee of The Connecticut Light and Power Co. at Hartford, while making a coupling test in conjunction with the Telephone Company, received a shock which knocked him to the ground. John Henry McCabe, a fellow worker, who was only a few feet away, immediately rushed to Raytkwich and started applying the Prone Pressure Method of Resuscitation. In about 15 minutes the patient was breathing fairly normally. A doctor administered a stimulant and sent him to the hospital. On the way to the hospital McCabe applied the prone pressure to Raytkwich several times when he showed signs of having difficulty in breathing.

On May 8, at the Pease House, Old Saybrook, Conn., Mr. C. L. Campbell, President of The Connecticut Light and Power Company, presented the Edison Medal to Mr. McCabe, and Certificates of Assistance to Messrs. Michael M. Strukus, Walter J. Regan, Kenneth A. Peterson, James E. Beardsley, Peter Moleske, Herbert L. Stewart, Ralph U. Barnes, James J. Fitzgerald and Hugh J. Garrity, Jr., before a gathering of more than two hundred employees and their wives. Newspaper publicity was carried on the resuscitation and presentation by a number of Connecticut papers.

CAMDEN LINE CREW

New Jersey

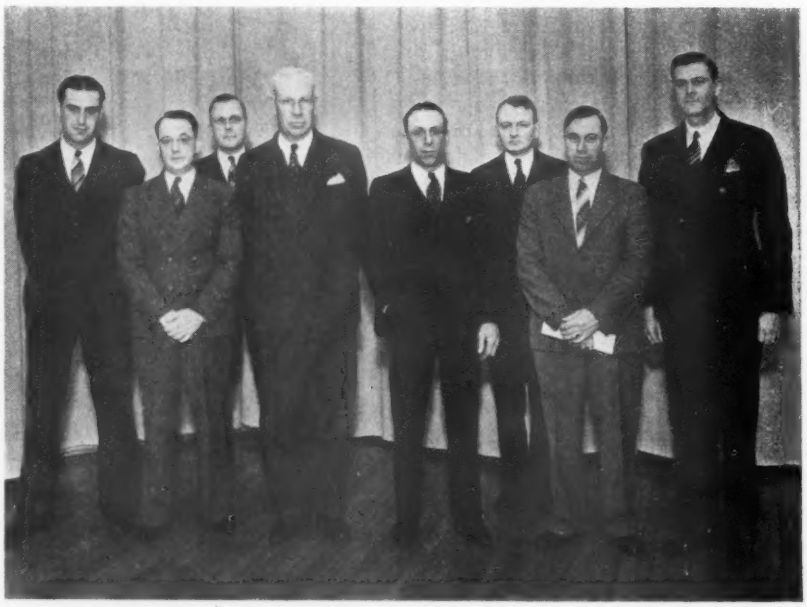
On August 1, 1938, John Gaylord, a lineman employed by the Public Service Electric & Gas Co., at Camden, N. J., while installing a lightning arrester on a transformer on a 35-foot pole came in contact with the live lead to the transformer and became grounded against the secondary rack. Clarence Riess, a fellow lineman, who was working on the pole, pulled Gaylord loose from the current and started resuscitation, continuing until Gaylord began to breathe. A line was placed around Gaylord's body and he was lowered to the ground. Riess also assisted in the resuscitation on the ground level. Gaylord then regained consciousness and was immediately removed to the hospital. Riess was assisted by a number of the men composing the line crew. Gaylord received a burn on right arm below elbow, approximately 3 inches in diameter and approximately 1 inch deep. Burns on left leg area about 6 inches in diameter.

The Edison Electric Institute Resuscitation Medal was presented to the Camden Line Crew, W. R. James, Foreman, and Miniature Medals to Messrs. W. R. James, Clarence Riess, and Elmer W. Marzi on March 21, 1939, at a meeting of the Public Service Electric Association, at which there was an attendance of approximately four hundred persons. Presentation was made by Mr. J. T. Barron, Vice-President in Charge of Electric Operation of the Public Service Electric and Gas Company.

M. E. SHOTWELL

Idaho

In attempting to dead end the neutral of a 6900 volt circuit, A. E. Shillingburg, a member of an Idaho Power Company crew at Boise, on June 21, 1938, contacted the 4000 volt line to ground. He was kicked loose from the pole by S. C. Reed, a fellow employee, and fell by short jerks to the bottom; his safety belt holding to the pole. M. E. Shotwell, foreman, removed the safety belt and immediately applied artificial respiration. After an estimated period of five minutes, Shillingburg was breathing without



Camden Line Crew of Public Service Electric and Gas Company and officials of the Company—Left to right, Elmer W. Marzi, auto driver; John Gaylord, lineman (resuscitated); C. L. Dudley, Division Superintendent, Southern Division; J. T. Barron, Vice President in Charge of Electric Operation; Clarence Riess, lineman; W. R. Smith, Safety Engineer; W. R. James, line foreman, and G. W. Bower, District Superintendent, Camden Division.

assistance and was removed to a doctor's office. Shillingburg suffered the loss of index finger of right hand at metacarpal joint, loss of the third finger of left hand, including metacarpal joint, and back injury.

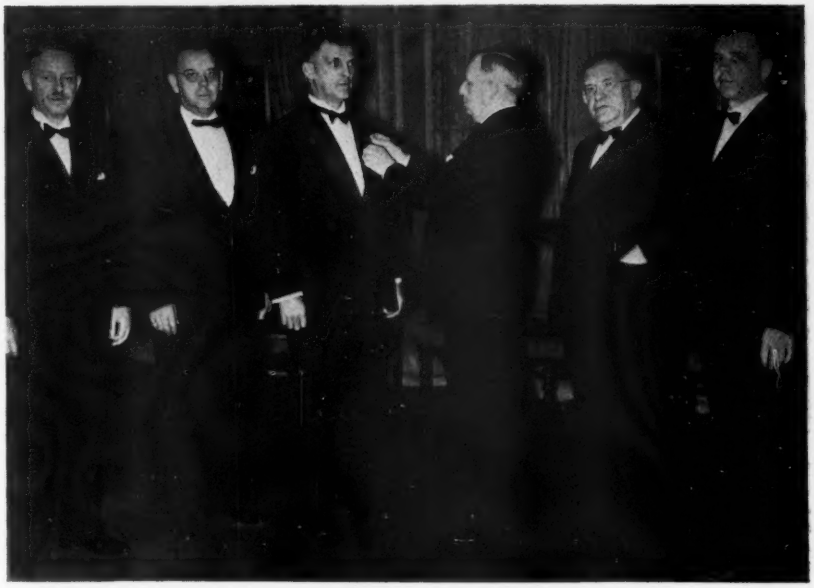
On January 11, 1939, at one of the largest safety meetings of the Idaho Power Company for division foremen, Mr. R. B. King, General Superintendent, presented the Edison Medal and Certificate to Mr. Shotwell.

WINFIELD JESS

New Jersey

On November 4, 1938, at 4 a. m., Clarence Sockwell, member of an Atlantic City Electric Company line crew, was getting in position to pull fuses on an H-frame transformer bank when his forehead came in contact with a fuse terminal and his shoulder touched against a lead from the center transformer. Sockwell fell unconscious to the ground, a distance of 14 feet. Winfield Jess, foreman, who had been directing the work, immediately started artificial respiration. In approximately 15 minutes the patient was able to breathe unaided and was removed to the hospital. Two electrical burns were suffered by Sockwell on the upper part of forehead, other burns on right shoulder and left armpit, and flash burns on back of both hands.

At a company gathering held on April 27, 1939, Mr. J. B. Hill, Vice-President of the Atlantic City Electric Company, presented the Edison Medal and Certificate to Mr. Jess.



At the presentation of Medal to Winfield Jess—Left to right, H. M. Sawyer, Vice President, American Gas and Electric Service Corp.; E. A. Lewis, Vice President and General Manager, Atlantic City Electric Company; Winfield Jess; J. B. Hill, Vice President; R. E. Swift, Ass't General Manager, and Albert M. Newman, Gen'l Supt., Atlantic City Electric Company.

CONNOR'S LINE CREW

Delaware

On October 18, 1938, Preston Towers, a member of a Delaware Power and Light Company line crew, headed by M. E. Connor, was detailed to lower a secondary rack to make room for a ground wire to be installed on the side of a pole. As he reached up to place a hand line over the clear side of a cross-arm above him, his right spur cut out of the pole, throwing him off balance, and causing his head to come in contact with a transformer lead wire, while his left foot touched a ground wire. W. J. Johnson and J. T. O'Neal, members of the crew, rushed up the pole and lowered him to the ground. M. E. Connor, foreman, and H. J. Walmsley immediately applied the Prone Pressure Method and after fifteen minutes the patient recovered consciousness. He was examined by a doctor and then taken home. He suffered third degree burn of scalp, left side of head and inner side of left foot at base of big toe.

On April 18, 1939, at a company Safety Meeting, medals and certificates were awarded to Mr. Connor and his crew, consisting of Messrs. John T. O'Neal, Harvey J. Walmsley and W. J. Johnson. The presentations were made by Mr. M. G. Kennedy, Vice-President and General Manager of the Delaware Power and Light Company. The presentation of the crew medal and certificate was made to David A. Anderson, General Foreman of the Line Department.

Connor's Line Crew presentation—Left to right, Matthew G. Kennedy, Vice President and General Manager of the Delaware Power and Light Company; David A. Anderson, general line foreman; Marshall Connor, crew foreman; Harvey J. Walmsley and John T. O'Neal, lineman.

JAMES H. DAVIS

West Virginia

Earl Shaw, a member of a line crew of the Appalachian Electric Power Company, Bluefield, W. Va., on the afternoon of Jan. 22, 1939, was preparing wire for a splice. The two ends had been set-up for pulling together and Shaw, kneeling, had the block in his hand when the line suddenly became energized. James H. Davis, his foreman, pulled him clear from the line with a woolen mackinaw and immediately applied the Schafer Prone Pressure Method of Resuscitation. In approximately 8 to 10 minutes, the patient was breathing and able to talk. He was then taken to the hospital. Shaw suffered third degree burns which resulted in the amputation of three and one-half fingers from the left hand and the right foot was amputated above the ankle.

Mr. D. C. Duncan, Assistant Safety Director, Appalachian Electric Power Company, presented the Edison Medal and Certificate to Mr. Davis on Friday, July 21, 1939, at the Central Safety Committee meeting. A number of West Virginia papers carried the story of the resuscitation and presentation of the Medal.

W. A. GLOVER

Alabama

On Jan. 25, 1939, W. A. Glover, local manager of the Alabama Power Company at

C. H. WALLACE

KENNETH I. ESPESETH

THOMAS A. BRUSCH

Prattville, Ala., and H. C. Cox were checking telephone clearances with what was thought to be an all-cloth tape but which later proved to be reinforced with copper strands. Glover was holding the leather case of the tape and Cox had reeled off about 50 feet of the tape, the end of which he threw over an 11-kv line. When the tape contacted the electric conductor, Glover received a shock and immediately threw the case and tape down. He then realized Cox was receiving a shock and could not get away from the tape. With the aid of a tree trimmer, he was able to get Cox free from the line and immediately applied the Schafer Prone Pressure Method of Resuscitation. After about ten minutes, Cox was able to breathe without assistance and was then removed to the hospital. There were burns in Cox's palm of the left hand, right shoulder, right hip, right thigh and outside of right leg.

The Edison Medal was presented at a Safety Meeting to Mr. Glover by Mr. J. O. Speed, Manager of Safety and Industrial Relations of the Alabama Power Company on February 13, 1940, before approximately sixty employees.

C. H. WALLACE

Texas

At 12:30 p. m. on April 5, 1939, workmen digging a trench for a sewer line accidentally cut an underground street lighting circuit of the Community Public Service Company, Fort Worth, Tex. While the workmen were at lunch an eight year old girl came by the ditch and picked up the wire. C. H. Wallace, Local Manager of the Community Public Service Company at Gatesville, Tex., found the little girl unconscious and released her from the circuit by making a sling of her dress. He then applied artificial respiration and in about five minutes the child regained consciousness and was taken to a doctor. Her right hand was dressed for burns by the doctor in his office.

Mr. T. O. Clark of the Community Public Service Company at Clifton, Tex., presented the Medal and Certificate to Mr. Wallace, at a luncheon on Sept. 23, 1939 which was attended by a number of Division employees and their wives, several Ministers of local churches and by the Superintendent of the Clifton Schools. Due publicity was given to the presentation of the Medal in the local papers.

KENNETH I. ESPESETH

Wisconsin

Shortly after nine o'clock on the morning of May 16, 1939, Merle K. Steensland, an employee of Wisconsin Hydro Electric Company, Amery, Wis., was tightening some line hardware on a transformer pole when the wrench which he was using slipped and came in contact with a nearby 6900 volt wire. The shock rendered Steensland unconscious and he fell to the ground. Kenneth I. Espeseth, District Superintendent, rushed to his aid and immediately applied artificial respiration. In about fifteen minutes, the patient regained consciousness and was later removed to the hospital. There were second and third degree burns at the base of index and middle fingers of left hand and on the palmar surface of little finger, index and thumb on distal phalax of the right hand, and on palm of right hand, as well as sprain of lumbar region and sacro iliac joints.

On the evening of Nov. 17, 1939, a meeting of about seventy employees and friends was held in Amery, Wis., primarily for a safety meeting. After talks by several outstanding speakers, the Edison Medal and Certificate were presented by Mr. R. M. Hougher, President and General Manager of the Wisconsin Hydro Electric Company, to Mr. Espeseth. Several local papers gave publicity to the resuscitation and presentation of the Medal.

ED. HUSKER'S LINE CREW

Michigan

John E. Weisend, a member of a line crew of Consumers Power Company, Jackson, Mich., on the morning of June 6, 1939, was preparing to hook up the primary leads of a power bank to the energized primary fuse cutout on a pole when due to lack of concentration he received a shock. He cleared himself from the circuit and then dropped unconscious into his safety belt. He was removed from the pole and resuscitation applied by members of the crew, headed by Edward C. Husker, foreman. After about 45 minutes the patient was breathing without assistance and was removed to a hospital. Weisend suffered shock and small electric burn on left forehead.

The Edison Medal and Certificate were presented to Mr. Husker by Mr. H. J. Burton, Superintendent, Personnel and Instruction Department of the Consumers Power Company, at a special meeting of the Electric Distribution Department employees on Thursday, February 8, 1940. Miniature Medals were given to the crew consisting of Messrs. Edward C. Husker, Leo G. Eastman, Oscar W. Anderson, William Hendershot and Willard L. Freemire.

(*Continued on page* 88)

Husker's Line Crew—Left to right, H. J. Burton, Supt. Personnel and Instruction department; Lloyd A. Southard, Supt. Electric Distribution, Jackson Division; Edward C. Husker, crew foreman; John E. Weisend (man resuscitated); Leo G. Eastman; Oscar W. Anderson; William Hendershot and Willard L. Freemire.

Promotional Theme for the 1940 Electric Refrigerator Program

MKB's Electric Refrigeration Program Provides Effective Sales Tools

METHODS and ideas which will help stimulate refrigerator sales should be welcomed by every utility executive responsible for domestic sales. The Modern Kitchen Bureau's electric refrigeration program for 1940 places effective sales tools at the disposal of every utility interested in stepping up refrigerator sales on his company's lines.

Theme of the new program is "Twice the Value at Half the Cost." Emphasis is on use rather than on the appliance itself, but it is the use of *1940* electric refrigerators rather than earlier models that is featured.

Major sales points emphasized in all advertising and promotional copy include the fact that refrigerators today sell at prices approximately half what equivalent refrigerators sold for 10 years ago; that they are as much as 50 per cent lower in operating costs; that they freeze twice the ice in half the time; that they have the plus power to keep foods safe regardless of weather conditions; and that they pay for themselves by the savings they make possible.

A series of six newspaper advertisements tells this story effectively in copy and illustration. Mats for the series are available in two sizes, the larger advertisements five columns wide by 15 inches long, and the smaller ones three columns by 10½ inches. Copy is distinctly feminine in appeal and emotional in technique. The sixth advertisement in the series is designed to suggest ways in which utility advertising managers can continue the series to greater length if desired.

To provide direct help to the dealer the program includes a colorful window banner, 25 by 38 inches, and six catchy display cards that "sugar coat" the specific sales messages by presenting them in rhyme. A 24-sheet billboard poster, a direct mail folder, and a series of radio announcements of 20, 50 and 100 words in length complete the list of materials prepared by the Bureau for this program.

All-Electric Kitchen Promotion

The Bureau has made some important additions this year to its series of promotional materials for the all-electric kitchen. This program is designed for use by utilities promoting the sale of complete electric kitchens—the ensemble selling idea. It may be used equally well by utilities to develop the step-by-step building of the kitchen, since it plants the idea of the completed kitchen in the housewife's mind, yet permits her to add new appliances one at a time as circumstances permit.

The new materials include an attractive envelope or bill enclosure, two mailing folders, a counter card in color, and a leaflet entitled: "How to Plan a Modern, All-Electric Kitchen." This leaflet gives an excellent outline of the fundamentals of kitchen planning which any home owner can readily follow. Samples of this material will be mailed without charge, on request.

The Bureau's successful meal planning book, "Meals Go Modern—Electrically," now in its fifth edition, and its popular "Home Office" leaflet continue to be available.

Range and Water Heater Programs

A record-breaking amount of promotional materials included in the electric range and water heater programs has been requested from Bureau headquarters. There is every evidence that both programs are facing their biggest year, and that more utility companies than ever before will participate actively in them. Those who have not yet arranged to obtain their supplies for both programs should do so at the earliest possible date.

ELECTRIC REFRIGERATOR AND ELECTRIC RANGE SALES

Household Models Only

FOR MONTH OF DECEMBER, 1939, AND YEAR OF 1939

States	DOMESTIC ELECTRIC RANGES			ELECTRIC REFRIGERATORS		
	Month of December 1939	Month of November 1939	Year 1939	Month of December 1939	Month of December 1938	Year 1939
Total United States	14,453	20,607	320,753	92,479	47,599	1,956,002
Maine	95	61	3,250	294	139	7,880
New Hampshire	147	89	1,930	24	149	5,510
Vermont	45	49	1,576	201	60	3,729
Massachusetts	479	819	7,861	4,317	1,645	75,094
Rhode Island	18	84	941	375	171	9,714
Connecticut	207	552	4,942	(597)	785	31,344
Total New England	991	1,654	20,500	4,614	2,949	133,271
New York	902	1,200	14,600	12,249	8,888	265,854
New Jersey	14	124	4,391	2,267	2,039	74,632
Pennsylvania	902	1,108	22,185	8,373	4,000	182,911
Total Middle Atlantic	1,818	2,432	41,176	22,889	14,927	523,397
Ohio	1,311	1,626	23,643	5,395	2,490	112,655
Indiana	533	988	14,542	2,502	886	49,323
Illinois	810	1,331	19,196	7,667	5,448	157,439
Michigan	2,121	2,559	29,164	3,892	3,359	91,223
Wisconsin	803	862	14,102	2,162	1,056	41,132
Total East North Central	5,578	7,366	100,647	21,618	13,239	451,772
Minnesota	859	787	12,496	2,246	1,843	51,521
Iowa	147	304	5,441	1,372	327	35,073
Missouri	303	485	9,578	2,543	1,007	54,976
North Dakota	159	166	2,364	140	132	3,880
South Dakota	177	117	2,519	202	135	4,962
Nebraska	51	100	1,770	571	98	14,870
Kansas	65	65	3,208	845	226	18,240
Total West North Central	1,761	2,024	37,376	7,919	3,768	183,522
Delaware	14	28	347	181	17	3,993
Maryland	166	176	2,354	2,144	607	24,406
District of Columbia	199	185	2,793	977	689	20,790
Virginia	122	163	5,978	1,538	868	31,318
West Virginia	95	118	2,560	760	460	19,289
North Carolina	433	464	10,765	1,145	620	34,327
South Carolina	167	214	3,405	661	182	15,347
Georgia	134	378	7,246	771	293	27,527
Florida	624	1,310	11,859	2,508	1,686	28,473
Total South Atlantic	1,954	3,036	47,307	10,685	5,422	205,470
Kentucky	32	136	2,234	1,118	224	26,823
Tennessee	352	414	9,989	1,191	65	32,573
Alabama	349	195	5,141	588	272	18,842
Mississippi	102	1	1,542	418	119	11,232
Total East South Central	835	746	18,906	3,315	680	89,470
Arkansas	18	32	659	661	45	11,941
Louisiana	(49)	52	823	1,029	547	25,024
Oklahoma	49	7	557	2,160	94	21,496
Texas	141	138	4,644	2,448	893	76,853
Total West South Central	159	229	6,683	6,298	1,579	135,314
Montana	32	49	1,510	173	29	5,357
Idaho	9	55	2,605	466	124	6,921
Wyoming	(8)	26	293	161	69	2,558
Colorado	(9)	24	2,112	907	414	13,248
New Mexico	2	27	194	125	40	3,228
Arizona	39	16	693	118	(60)	5,058
Utah	175	166	4,433	549	(29)	9,373
Nevada	58	21	726	119	14	1,780
Total Mountain	298	384	12,566	2,618	601	47,523
Washington	649	1,113	13,172	2,521	394	34,155
Oregon	275	637	9,973	1,710	208	16,046
California	135	986	12,447	8,292	3,832	136,062
Total Pacific	1,059	2,736	35,592	12,523	4,434	186,263

Figures based on report by the NEMA on Net Sales to Dealers and Jobbers.

New Standards Now Ready for Distribution Transformers

First Report (Feb. 1940) EEI-NEMA Joint Committee on Standards for Distribution Transformers

E.E.I. Pub. No. G-6—N.E.M.A. Pub. No. 106. Price 25¢ to members and their employees; 60¢ to non-members in the U.S.A.; 70¢ to foreign countries. Published by the Edison Electric Institute, 420 Lexington Avenue, New York, and the National Electrical Manufacturers Association, 155 East 44th Street, New York.

IN recent years the electrical industry has been faced with an urgent need for simplification and standardization in distribution transformer practice to arrest a steadily growing diversity of requirements of individual purchasers that has placed unnecessary burdens on both manufacturers and users. In the spring of 1938 a Joint Committee of the E.E.I. and NEMA was formed to work out a reasonable consolidation of transformer design practices in the interest of lower cost to manufacturers and lower prices to users. The initial achievement of this committee is incorporated in this report, the first of a series, which establishes design standards for certain mechanical and electrical features of single-phase, pole type distribution transformers rated 25 kva and below, 15,000 volts and below.

Two basic objectives were established by the Joint Committee; each aimed at reduction of manufacturing cost through simplification and unification of practice, and reduction of field cost from increased operating convenience.

These objectives are:

(1) A basic or standard transformer embodying essential features, with additional equipment available as extras.

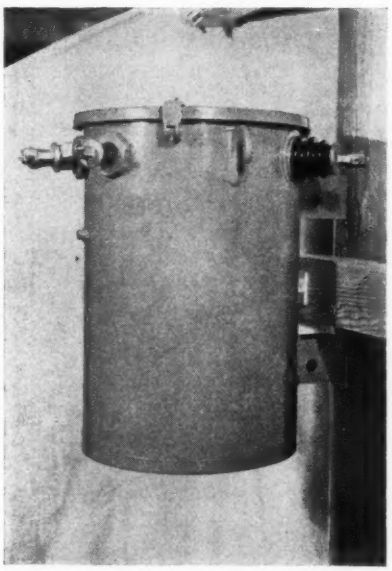
(2) Interchangeable mounting of all makes, with suitable grouping of sizes.

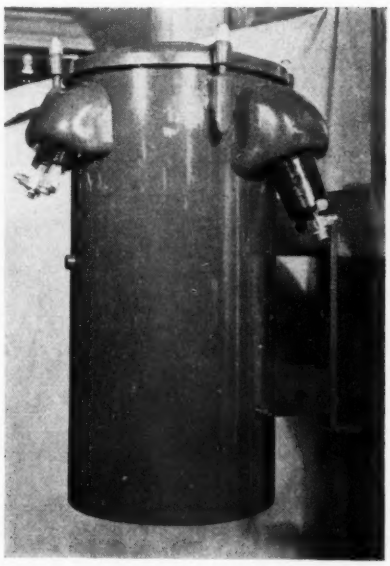
The Standards now presented, together with those under preparation, offer a practicable readjustment of present usage that will eventuate in more satisfactory practices and in savings to all concerned. While the money savings will accrue most to companies that can promptly use the standardized equipment, those companies that, because of conditions peculiar to their systems, must purchase equipment that is special in some features, will also realize partial benefits, or even if complete specialization is necessary, will not be restricted in obtaining equipment to meet their needs. The Joint Committee has been careful to avoid setting up conditions that would preclude any user from obtaining whatever equipment may be necessary. However, it is believed that the large majority of users will be able readily to realize substantial savings from utilizing the standardized product.

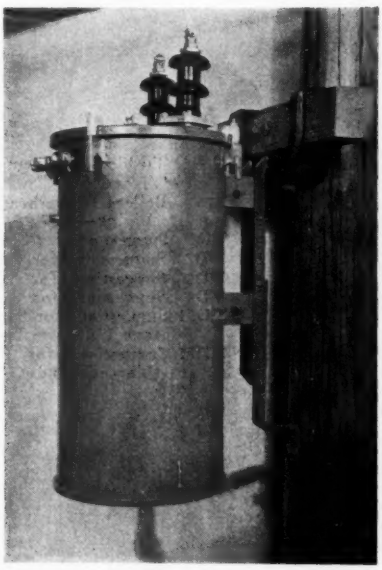
Aside from the lower manufacturing costs and lower purchase prices that will be realized on standard transformers is the opportunity for substantial savings to the user companies from greater operating convenience, and from simplifications in construction that will be facilitated by standardized arrangement. Among the benefits may be mentioned the following:

There is increased flexibility in transformer mounting, in addition to interchangeability among all makes. Although the new mounting is designed primarily for direct bolting to the pole, it also is adapted for mounting on either one crossarm with metal kicker, or mounting on two crossarms, or bolting direct to the pole astride the crossarm. This gives latitude for relating bushing terminal positions to wire carrying crossarm levels, whether bolted direct to the

(*Continued on page* 87)







Transformers Mounted in Accordance With Provisions of the New E.E.I.-NEMA Distribution Transformer Standards

Single phase 60-cycle Transformer, 3 kva
High Voltage 4800/8320Y
Low Voltage 120/240
2—High Voltage Side-Wall Bushings
3—Low Voltage Side-Wall Bushings

Single phase 60-cycle Transformer, 5 kva
High Voltage 2400/4160Y
Low Voltage 120/240
2—High Voltage Pocket Bushings
3—Terminal Low Voltage Pocket Bushings

Single phase 60-cycle Transformer, 10 kva
High Voltage 7200/12470
Low Voltage 120/240
2—High Voltage Cover Bushings
3—Low Voltage Side-Wall Bushings

PUBLICATIONS OF THE INSTITUTE

Pub. No.		*Date Issued*	*Price to Members*	*Price to Non-Members*	*Price to Foreign Countries*
G1	A-C Network Operation, 1936-1937	(8/39)	$0.80	$2.00	$2.10
G2	The Electric Light and Power Industry in 1938	(5/39)	.30	.75	.85
G3	Combustion—1939	(12/39)	.80	2.00	2.15
G4	Electric Metal-Melting Furnaces	(1/40)	.80	2.00	2.15
G5	Cable Operation—1938	(1/40)	.60	1.50	1.60
G6	First Report of E.E.I.-N.E.M.A. Joint Committee on Standards for Distribution Transformers	(2/40)	.25	.60	.70
G7	Turbines, Condensers and Pumps—1939	(1/40)	.70	1.75	1.85
F1	Treatment and Inspection of Creosoted Pine Poles	(2/38)	.30	.75	.85
F2	Inductive Coordination of Rural Power and Telephone Systems	(1/38)	.80	2.00	2.15
F3	Distribution Transformer Load Characteristics—1938	(4/38)	1.00	2.50	2.65
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Prime Movers Committee Meeting

E. L. Hopping, *Chairman*

CHAIRMAN HOPPING presided over a well attended meeting of the Prime Movers Committee, held at the Hotel Statler, Detroit, Michigan, Feb. 5 and 6, during which the major portion of the time was devoted to Round Table Discussion which has, over the past year, created much interest in this group.

A rather lengthy discussion was devoted to the requirements in carbon-molybdenum pipe for the electric power industry for the coming year. It developed that the industry could cooperate on certain sizes in order to give the tube manufacturers a chance to stock same. On specifications, it is apparent that the Committees on Code for Pressure Piping and the Code on Boilers will have to meet and straighten out certain points where they do not agree. A representative of the Prime Movers Committee, also serving on the Boiler Code Committee, was requested to discuss this matter with representatives of the Code for Pressure Piping.

The Chairman invited the Committee to Philadelphia on February 27 to a meeting of the A.S.M.E. at which time, Mr. Hague of the Westinghouse Electric and Manufacturing Company will discuss the development work on impulse blading being carried on through optical observation at the Schuylkill Station of the Philadelphia Electric Company. The blades under observation are being operated at a speed of 3600 rpm in a turbine supplied with steam at 1250 lb. per sq. in., 900 deg. F. Members were invited to visit the Plant from 3 to 5 o'clock on that date.

Mr. Boetcher of the Metallurgical Committee was instructed to advise the Committee on Code for Pressure Piping that the Prime Movers Committee were unanimously opposed to proposed extension of the Code to cover piping up to pressures of 2500 psi and temperatures up to 1000 deg. F.

Next meeting of the Committee will be held at the Edgewater Beach Hotel in Chicago in May. On Monday evening during this meeting, this Committee and members of any other Edison Electric Institute committee in the Hotel at that time will be privileged to hear a talk by Mr. Hague on the development work on impulse blades mentioned above.

Transmission and Distribution Committee Meeting

W. F. Nimmo, *Chairman*

THE winter meeting of the Transmission and Distribution Committee was held on Feb. 5, 6 and 7 at the Hotel Jefferson, St. Louis, Mo. This was the first meeting held by this committee since the Subject Committee on Underground Methods and Accessories was transferred to the main committee as the Underground Group. At this meeting the entire committee was in session on three days, the first day being given over to the presentation of the program scheduled by the group formerly known as the Subject Committee on Underground Methods and Accessories.

The program scheduled by the Underground Group consisted of papers and discussions on:

(a) Load Cycle Aging Test in Relation to Improvement of Solid Type Rubber Cable—by R. W. Atkinson, General Cable Corporation.

(b) Design Features and Use of Distribution Boxes and Manholes Recently Developed by The Consolidated Edison Company of New York, Inc.—by W. C. Kochendoerffer, Consolidated Edison Co. of New York, Inc. (Due to Mr. Kochendoerffer's absence, this paper was presented by Mr. Xenis.)

(c) The Caisson Method of Installing Manholes and Similar Sub-Surface Structures—by C. P. Xenis, Consolidated Edison Co. of New York, Inc.

(d) New I.P.C.E.A.* Current-Carrying Capacity Tables for Rubber and Varnished Cambric-Insulated Cables—by G. B. Shanklin, General Electric Co.

(e) Metallurgical Factors for Consideration in Choice of Materials—by W. F. Davidson, Consolidated Edison Co. of New York, Inc.

The remainder of the day was given over to a discussion of the above papers and to a round table discussion of various miscellaneous subjects that had been proposed for discussion prior to the meeting. These included the use of pyranol filled transformers for a-c low voltage networks, operating results obtained with various types of cable used on a-c low voltage networks, and minimum temperatures for pulling varnished cambric insulated cable into ducts.

The forenoon session on Tuesday, Feb. 6, was devoted to the presentation of a report of the Street Lighting Subcommittee, by W. B. Elmer of the Boston Edison Company; a report of the Distribution Transformer Field Load Testing Subcommittee on the Thermal Characteristics and Review of Current Practices, by F. E. Sanford of the Cincinnati Gas & Electric Company; a report of the Tree Clearance Subcommittee, by G. D. Blair of the Consumers Power Company; the presentation of a paper entitled Development of Multiple Street Lighting System in Minneapolis, by H. G. Conant of the Northern States Power Company, and a paper entitled Selection of Transformer Size by Load Cycle Requirements, by M. F. Beavers of the General Electric Company.

Mr. M. D. Hooven of the Public Service Electric & Gas Company reported on the various activities under the Cooperative Projects Group including continuing property records, voltage utilization, depreciation, radio interference and the use of radio by power companies for emergency service.

During the afternoon session discussions were given by Mr. H. E. Kent of the General Office, Edison Electric Institute, on Coordination in Connection with Use of Shunt Capacitors on Power Feeders, and A Small Neutralizing Transformer for Protection of Communication Circuits Entering Power Stations. There was also presented during this session a paper by Mr. V. G. Rettig of the Cincinnati Gas & Electric Company on Superposition Methods in Calculating Effects of Additions to Power Systems and an illustrated talk by Mr. D. M. Simmons of the General Cable Corporation on the fittings used in connection with the 287-kv Boulder Dam transmission lines.

On the evening of Feb. 6 a subject session was held on Distribution Transformer Standards. A. E. Silver, Ebasco Services, Inc., presided at this meeting and discussed the report of the Joint E.E.I.-NEMA Committee on Standards for Distribution Transformers. There was available at this meeting an exhibit of pole type transformers that had been designed and built in accordance with the recommended standards and there

*Insulated Power Cable Engineers Association.

was an extended discussion on various features involved in this standardization work. The first report of this committee, which is just off the press, is reviewed in this issue of the BULLETIN.

Practically all of the forenoon session of Feb. 7 was taken up with reports under the Standards and Specifications Group. Reports were made by Mr. Silver and Mr. H. B. Keath, Wagner Electric Corporation, on the distribution transformer standardization. Recommended specifications for pole line hardware were presented by E. V. Sayles of the Commonwealth & Southern Corporation, and proposed wood crossarm specificatins were discussed by L. G. Smith of the Consolidated Gas, Electric Light & Power Company.

The remainder of the day was devoted to inspection trips to the plants of the Moloney Electric Company, Wagner Electric Corporation, James R. Kearney Corporation and W. N. Matthews Corporation. In addition to these, several other inspection trips had been arranged for those attending the meeting to visit places of interest in plant of the Union Electric Company of Missouri.

This meeting was well attended by representatives of electric light and power companies throughout the middle and southwestern sections of the country. There were fewer representatives of manufacturers in attendance than at previous meetings due to the plan that has been put into effect restricting the attendance of manufacturers' representatives to engineers who are invited to attend those sessions in which they are particularly interested.

The next meeting of the committee will be held on May 6, 7 and 8 at the Edgewater Beach Hotel in Chicago, in connection with the meetings of the various engineering committees of the Edison Electric Institute.

Meters and Services Committee

A. B. Craig, *Chairman*

THE second meeting of the 1939-40 Committee year was held at the Hotel John Marshall, Richmond, Va., on Feb. 14, 15 and 16. All members of the Committee, together with a number of correspondents and guests were present. The total attendance including manufacturing representatives was about 50.

The Committee considers Richmond a most happy choice for this meeting. Not only are the hotel accommodations adequate and the city a place of great historical interest from a National as well as a Southern viewpoint but also a number of Southern meter engineers were able to attend.

The business session was opened on Feb. 14 and the Committee engaged in a discussion of metering problems. Various subjects groups reported on projects being actively studied. All groups reported definite progress since the last meeting, several stating that their assignments were nearing completion.

Revision of the Metermen's Handbook has been completed, the page proofs have been checked, the index prepared and actual printing is now in process. This project, which should be of great value to all metermen, is one which the Committee is glad to sponsor. No mention should be made of this revision without emphasizing the untiring efforts and prodigious labor of the Editorial Committee consisting of Messrs. A. J. Allen, O. K. Coleman and L. D. Price.

Mr. E. A. LeFever's report on the Standardization of Current Transformers on Primary Circuits provoked considerable discussion. Several avenues of obtaining the desired "long range" transformer are available, each of which has its advantages as well as disadvantages. The Committee is hopeful that this assignment will soon reach a satisfactory conclusion. It should be noted that Mr. G. N. Gosinski has been designated by the Electrical Equipment Committee to represent the relay section on this subject group.

Mr. J. C. Langdell reported that the subject group on Service Cables had completed its organization upon the designation of Mr. R. E. Morse to represent the Transmission and Distribution Committee. Preliminary investigations into the many phases of the subject have been started and are being actively pursued.

A number of standardization projects were reported and discussed. Several of these were completed and accepted by the Committee. These will be published in the BULLETIN as soon as they can be put in suitable shape for publication.

The problem of general acceptance of Standards and the elimination of special requirements was discussed at length. It was recognized by all that these special features are costly not only to the Companies involved but also to the industry as a whole. A suggestion was made that many of these special features could be eliminated by the judicious use of the BULLETIN as an educational medium.

On Feb. 15 a joint session was held with the A.E.I.C. Committee on Metering and Service Methods and with the meter manufacturers. Many problems of mutual interest were discussed.

Feb. 16 was devoted to a round table discussion of individual operating problems and experiences. During the second half of this day the meter manufacturers were invited to attend. These discussions were entirely informal. It is believed that this session was most helpful to all those who participated.

Accident Prevention Committee Meeting

W. R. Smith, *Chairman*

THE winter meeting of the Accident Prevention Committee of the Edison Electric Institute was held at the Hotel Jefferson in St. Louis, Mo., on Feb. 8 and 9. Owing to the illness of Chairman W. R. Smith, he was unable to be present and former Chairman L. M. Shadgett of the Georgia Power Company, presided during this meeting.

Discussions of accident statistics, cause and location data, line hazards and rubber protective equipment for linemen were subjects of active interest and occupied the first day of this meeting. The subject of employee training was discussed in considerable detail by Mr. W. A. Buchanan of the Appalachian Electric Power Company. Mr. Buchanan referred to the system of employee training which has been developed among the employees of his organization. This discussion was of wide interest to those present. Other members of the committee described what they are doing along this line or the plans they have in mind on this subject.

There was an extensive discussion of the type of gloves used for cable splicing and similar work on low voltages. Apparently this has been a problem among some companies for several years and some difficulty exists in getting the proper type of glove which affords protection, is satisfactory to the workmen and which is suitable for use under both dry and damp conditions.

The latter part of the meeting during the forenoon of Feb. 8 was devoted to discussion and inspection of the distribution transformer exhibit that had been arranged for the meeting of the Transmission and Distribution Committee and which was allowed to remain in place during the meeting of the Accident Prevention Committee. Mr. Merrill DeMerit of the West Penn Power Company, who has been active in the preparation of the distribution transformer standards in the joint E.E.I.-NEMA Committee, was present to explain the various features of this standardization work, including the safety features that had been provided in the preparation of these standards.

Other subjects discussed at this meeting included the principles of hold-off, office hazards, kite flying and electric fences. Messrs. Godwin and Diehl discussed various subjects which have been dealt with by the National Safety Council and which are of interest to this committee.

It was brought out during this meeting that this committee is desirous to work with the various accident prevention committees and groups throughout the country, particularly those consisting of electric light and power company engineers and safety men among the sectional and state organizations. It was pointed out that much can be accomplished by coordinating the efforts of these groups which are devoting time and attention to accident prevention and safety subjects and the closest cooperation is desired.

The next meeting of this committee is scheduled for the week of May 6 at the Edgewater Beach Hotel in Chicago.

Electrical Equipment Committee Meeting

H. L. Wallau, *Chairman*

THE winter meeting of the Electrical Equipment Committee was held at the Netherland Plaza Hotel, Cincinnati, Ohio, Feb. 12 and 13. In addition to 26 members of this committee a total of 35 guests attended these sessions.

On behalf of Mr. George Sutherland, Mr. R. W. Wilbraham reported the progress of the oil circuit breaker group. Some revisions have been made in the draft of the ASA Standard and it has been resubmitted to the Sectional Committee for a supplementary letter ballot. The committee has decided, after a thorough canvass, to eliminate the 69 kv 250,000 kva outdoor circuit breaker from the schedule of preferred rating. The committee is studying carefully the problem of standardization of size for the new oil-less circuit breakers. No conclusion as yet has been reached as to the proper procedure to follow in this matter.

A report summarizing the results of failure of bushings purchased since 1932 was presented. No serious defects have been brought to light. It is believed that testing and inspection has helped substantially in keeping down the failure rate.

Mr. John Van Veen of the Cincinnati Gas and Electric Company, described the training of operators and some of the functions of the maintenance man in a modern utility. This paper pointed out that the Cincinnati Gas and Electric Company carefully selects their operating personnel and puts these individuals through a thorough course of training and examinations before they are qualified to become operators. During the past decade there has been a high degree of specialization in the maintenance personnel due to the increased requirements for maintenance and accurate and careful adjustment of various items of equipment.

Mr. S. M. Hamill, of the Cincinnati Gas and Electric Company, described the new frequency and tie-line control recently installed on that system. He showed frequency and load curves of this equipment, controlling tie-line loading, station loading, and frequency for various conditions of operation. These curves showed the marked improvement which could be obtained with such automatic control over the best of manual control when the system was subjected to a fluctuating steel mill load of the order of 30,000 kw.

In discussing this paper Mr. Stanley Stokes pointed out the great improvement which had been effected in governors, both for steam and hydro units, during the past few years. At the present time manufacturers are in a position to supply governors of greatly improved characteristics and speed of operation. He pointed out that although the full advantage of these new governors could not be obtained when operating in parallel with existing governors, some of the advantage could be obtained and the adoption at this time would look forward to improved overall conditions at a future date.

Mr. Maxwell summarized the action of the Electrical Committee at its December meeting in the revision of the National Electrical Code. The Electrical Committee approved the use of synthetic thin-wall insulation and improved rubber insulation wire for rewiring. The committee also approved increasing the conduit fill from 40 per cent to 50 per cent for rewiring installations. These changes will permit the increase in current carrying capacities of existing conduits by two or more times. The proposals to use covered neutral cables and bare neutral in rigid conduit or electrical metallic tubing, were lost by a narrow margin from the required two-thirds majority for a change.

Mr. Maxwell pointed out that a substantial engineering exhibit showing the use of these materials in many locations was presented, and that there is little reason to feel discouraged due to the failure of obtaining complete approval at this time. Trial installations can still be made and every effort should be exercised by the utilities to use, and encourage the use of these materials and methods which test and experience have shown to be safe and economical, so that a greater preponderance of engineering evidence will be available by the next revision of the code. For example, buildings used exclusively for public utility operation and maintenance are not covered by the Electrical Code.

The Electrical Committee approved mandatory requirements for non-tamperable fuses, to become effective one year after the approval of the current revision of the code—probably September, 1941. A special subcommittee was appointed to study the problem of the interchangeability of such fuses. This interchangeability is of greatest importance to utilities in connection with the servicing of customers' supply since the lack of interchangeability will make the problem of availability of fuses for servicing almost an impossibility. Mr. O. K. Coleman, of the American Gas and Electric Company, is Chairman of this subcommittee and every effort should be exercised by the individual companies to support Mr. Coleman in developing interchangeable fuses.

The unsatisfactory operation of "hot spot" indicators on transformers has been

under study by Mr. R. T. Henry. This subject has been referred to the American Institute of Electrical Engineers Transformer Committee, and is being studied by them.

The committee reviewed some of the more recent cases of major apparatus troubles.

Mr. R. N. Conwell reported the results of his investigation of the effects of carbon tetrachloride when accidentally taken internally. The all too common practice of mouth-syphoning of this fluid should be absolutely prohibited, as a small amount taken internally may prove fatal. In addition, care should be taken to prevent inhaling the fumes, or absorption through the skin. First-aid treatment for ingestion of carbon tetrachloride is to give the patient calcium lactate, or calcium chloride as an emetic to induce vomiting, then keep the patient quiet and call a physician.

Mr. Conwell reviewed the experiments which had been made on the effect of fire fighting equipment spray on live electrical equipment. From the various tests which had been made and reported, there appears to be little danger of sufficient current passing through a hose stream to affect the men holding the hose, providing the fire fighting equipment is not brought too close to the live electrical equipment.

Mr. R. L. Webb of the Consolidated Edison Company presented a Preliminary Report on Guides for Initial, Periodic and Experimental Testing of Generator Insulation. This subject has been studied by a Subject Committee with a view to developing a method for determining the general condition of generator insulation and the evaluation, by a non-destructive test or tests, of the true dielectric strength of the insulation. The report reviews the various methods of testing generator insulation which have been tried, and discusses an interpretation of the results obtained from such tests. In addition, a review of the results of a survey of foreign practice on generator insulation tests was presented on behalf of the subject group.

Mr. F. A. Lane, on behalf of Mr. Philip Sporn, described the progress which is being made by the Joint Committee on Coordination of Insulation. After considerable study, some modifications have been made in the values presented in January, 1937, and the requirements have been revised to a withstand voltage basis. At a technical session of the American Institute of Electrical Engineers in January a symposium on Insulation Coordination was held, at which the values in Table I were published, and other papers on this subject were presented.

TABLE I—BASIC IMPULSE INSULATION LEVELS

Reference Class (Kv)	B.I.L. Based on Old Definition (Kv)	B.I.L. Old Definition Reduced 5% (Kv)	Proposed New B.I.L.* (Kv)
1.2	32	30	30
2.5	53	50	45
5.0	63	60	60
8.66	80	76	75
—	—	—	95
15	100	95	110
23	150	143	150
34.5	190	180	200
46	250	238	250
69	360	342	350
92	470	447	450
115	570	542	550
138	680	646	650
161	790	750	750
196	950	900	900
230	1100	1050	1050
287	1360	1300	1300
345	1620	1550	1550

*These levels represent definite steps between which no intermediate values will be recognized. It should be noted that the levels are proposed and still under consideration of the Joint Committee.

Note: Attention is called to the fact that equipment carrying a power frequency voltage rating which is numerically the same as the "Reference Class" in Table I is not necessarily required to have the impulse levels given in the table.

A number of discussions were presented at that meeting by those closely associated with this problem, and the general picture at the present time appears to be as follows:

1. These new proposed Basic Insulation Level's (B.I.L.'s) can be protected by present-day modern protective devices such as arresters, with what appears to be reasonable margins of protection. The proposed levels are sufficient in number and spacing to specify the general requirements of impulse insulation strength in practically all lines of equipment.

2. It was definitely pointed out that in establishing these B.I.L.'s, no attempt has yet been made to assign equipment to the proposed levels; this problem is the next step in the work of the Committee after the proposed levels have been definitely agreed upon. It will be noted in the table that a new level of 110 kv has been added, and in the setup is shown under the 15 kv reference class. It will also be noted that the 95 kv level has not been referred to any reference class. As a matter of fact, however, it plots on a smooth curve at approximately 12 kv.

The present situation appears to be that there are some insulators which, if they carried the reference class rating as shown in column 1 of Table I, might not be able to meet the corresponding B.I.L. in the fourth column. Then too, there appear to be some cases in the smaller oil circuit breakers where present-day breakers might have to be de-rated on an impulse insulation strength basis.

Mr. F. D. Wyatt reported on his study of normal and emergency rating of electrical equipment. A number of AIEE papers have recently been presented on cable loading, and there have been other papers on transformer loading. The subject is also being taken up with the foreign correspondents of the committee.

Mr. R. N. Conwell presented the results of his study of the physiological effects of CO_2 (carbon dioxide) on human beings. The growing use of this medium in fire fighting adds emphasis to the importance of taking the necessary precautions to avoid accidents, as the literature published on the subject indicates that the critical values are as follows:

6% to 8% CO_2 for one-half to 1 hour produces serious illness.

20% to 30% CO_2 will produce coma and death unless the subject is removed quickly to fresh air.

30% and over for thirty minutes will prove fatal.

Recognizing these conditions, the necessary precautions can be taken and the hazards in the use of carbon dioxide do not appear to be any greater than those accompanying the use of other types of extinguishers. The whole safety procedure is based on recognizing hazards, actually defining them, and providing adequate equipment and protection against these hazards.

Mr. W. W. Archer, Jr., of the Virginia Electric and Power Company, described the modernization of the 12th Street Power Station at Richmond, Va. The original No. 1 station was built in 1899 and the No. 2 station adjacent to it was started in 1912 with the installation of a 9375 kva 2300 volt steam turbine unit. Additions have been made from time to time and the adding of a 50,000 kva unit increased by nearly 70 per cent the generating capacity which required extensive rebuilding of the entire switching auxiliary to provide adequate safety and insurance against system interruption.

Mr. E. S. FITZ presented a paper describing the vibration and noise survey which was made in this station, and the various steps which have been taken to reduce the objectionable features of noise inherent in some of the equipment. These improvements have resulted in improved efficiency as well as increased comfort to the operating personnel.

Mr. L. W. Clark, of the Detroit Edison Company, presented two papers which have been prepared by the AIEE Subcommittee on Power Supply for Resistance Welding Machines. These papers, entitled "Guide to Good Electrical Performance of Resistance Welding Machines and Resistance Welder Installations" should prove of great value to all utility companies interested in this sub-

ject. The Welding Subcommittee is planning to have printed copies of these papers made, and orders for these reprints should be sent to the Subcommittee Chairman, Mr. L. W. Clark, Detroit Edison Company, Detroit, Mich., by April 1. The papers are of such a nature that they should be of great assistance to power salesmen in discussing these problems with prospective customers.

Mr. R. N. Conwell pointed out that his company was planning to purchase a few meters for the measurement of demand of resistance type welders, with the thought of forming a special rate to cover this type of equipment.

Mr. J. H. Foote reported that the recommendations of the committee made two years ago regarding the service features of electrical ranges have been adopted by all of the larger range manufacturers and the conditions relating to the installation of ranges have greatly improved as a result. Progress has been made in the development of a standard test specification for electric ranges. It is expected that these specifications will be approved by the Joint EEI-NEMA Committee very shortly and be available in report form.

The Water Heater Specifications, approved May 5, 1938, apparently are proving entirely satisfactory. In furthering this standardization work, the National Electrical Manufacturers Association adopted, Sept. 26, 1939, standard sizes for water heater elements. These sizes are:

600	watts	2000	watts
750	"	2500	"
1000	"	3000	"
1250	"	4000	"
1500	"	5000	"

Mr. Foote presented a preliminary report on utility voltage study. The standardization of service voltage involves a number of factors which must be given careful consideration, and will be further reviewed at the May meeting.

Mr. Stanley Stokes presented, for discussion, definitions and terms to be used in connection with utilization voltage. These terms include "utilization voltage," "rated voltage," "service voltage," "nominal voltage," "mean voltage," "maximum voltage," "minimum voltage," and "voltage spread." The subject is being given further study by the committee.

The next meeting of the committee will be held May 6 and 7, at the Edgewater Beach Hotel, Chicago, Ill.

Status of the Revision of the National Electrical Safety Code

THE revision of the National Electrical Safety Code, Fourth Edition, which was undertaken in May, 1937, is now drawing to a close. Section 1, Definitions of Special Terms, Section 9, Methods of Protective Grounding and Parts 1, 3, 4 and 5 have been completed and are available either in separate pamphlet form or are being printed. There will be a new part to the Fifth Edition designated as Part 6. This will consist of Safety Rules for Electric Fences and in the future this will be under a separate sectional committee.

Part 2, Rules for Overhead and Underground Supply and Communication Lines, has been finished by the subcommittees appointed to revise this part of the code, but probably will not be available in edited form for a few months longer, due to the fact that it is to come before the Technical Committee on Part 2 and then before the Sectional Committee for final action. It will then require considerable editing for publication.

Some revisions have been made in the district loading map by transferring certain areas from heavy to medium loading, while other areas are changed from medium to heavy. By far the greater areas involved have been changed from heavy to medium. However, all of the changes made have been based on a careful study of climatic records, weather bureau records and extensive experience. In fact, one of the states which is changed from heavy to medium had already been so changed by the local authorities before this part of the code was taken up for revision. A change is also recommended in the transverse wind load which determines the transverse strength of supporting structures. This change consists of reducing the wind load from 8 lbs. to 4 lbs. in heavy and medium loading areas, and from 12 lbs. to 9 lbs. in the light loading areas. For the most part, however, the over-all strength for Grades B and C construction remain unchanged because corresponding increases in factors of safety have been recommended. In some cases, due to a re-grouping of situations, reductions in over-all strength have resulted while in others increases have been the result. In general, what was formerly known as Grade A has been combined with Grade B into one grade of construction. As an example of the reductions in strength, where Grade C is required because of power lines crossing over communication lines, the transverse strength has been reduced by 25 per cent. As an example of the increases, where Grade B is required for power lines in joint use or conflicts with communications lines, the transverse strength has been increased by approximately 20 per cent. The conductor loading which determines the longitudinal strength of supports remains practically unchanged through the addition of a constant to the resultant of ice (when specified) and the wind loading.

The changes that are recommended and which are now before the Technical Committee on Part 2 consist of both increases and decreases from present code requirements. In some instances increased clearances are recommended and also increases in strength requirements. With all these, however, it is felt by those who have devoted months to this work that more situations are now covered in a manner satisfactory to the various interests involved, including the public, than has been the case with any previous edition of the code. Some of the changes recommended by the Subcommittee on Strength Requirements and Loading were made in principle only and the details reported by the Subcommittee were not necessarily intended to be final. Some of these have already undergone modifications which will be reported to the Technical Committee before its meeting is held.

The forthcoming edition will probably be somewhat more complicated in text arrangement than the Fourth Edition. This is to be expected for new situations have arisen and more facts and experience are available on which to base rules than was the case in any previous revision. The fact that the code is difficult to use and confusing to the uninitiated is not new for this has been true in every edition, including the First. It should be kept in mind that to prepare a code which provides reasonable safety and yet does not result in unnecessary cost in construction, at the same time covering conditions not in the present code and also taking into account materials and practices that have not been considered in previous editions, is no easy task. Familiarity with any code or similar set of rules is essential to its application.

C.E.A. Annual Winter Conference

THE Canadian Electrical Association held its 7th Annual Winter Conference in Montreal, Jan. 15-16, under the general chairmanship of J. E. Lawson, president of the Association and vice-president and general manager of Canadian Niagara Power Co. Ltd., Niagara Falls, Ont.

Over 250 delegates attended the Conference, during which twenty-two of the Association's active committees held meetings and discussed problems of common interest to their respective members and other delegates.

The *Accident Prevention Committee* discussed the possibility of preparing and issuing to member companies a pamphlet entitled "First Aid Equipment and Instruction" and a canvass of the members is being made to ascertain the need for such a booklet, which if required will be sold at cost to the members. Other subjects discussed included Workmen's Compensation; First Aid and Equipment; Safety Tagging and Tools.

Accounting problems were discussed by this *Committee* and included exemption of income tax for part of capital expenditures and a progress report regarding the preparation of a classification of accounts for Canadian electric utilities.

The *Advertising Committee* reported on Goodwill or Institutional advertising; Straight Commercial advertising and Billboards.

Kitchen & Laundry Appliances, Electric Housewares and Dealer Relations were the subjects of a group meeting where a thorough discussion relating to the sale of electric ranges, water heaters and refrigerators was heard, including the question of terms, time payments, standardization of water heaters and sales campaign.

The *Customer Relations Committee* discussed Employee Training and arranged for a showing of the new film prepared by the Vocafilm Corporation for training employees in better customer relations.

The probable effect of the War on rate trends was discussed by the *Rate Structures Committee*, as were problems in changing a commercial lighting rate from block to a demand rate, and problems involved by fluorescent lighting.

Short period loads due to war demands; heating by infra-red; Diesel competition; trend of heating loads and interchange of power were the subjects under discussion by the *Industrial Power & Heating* group, in addition to a general discussion on Electric Welders.

The *Lighting Committee* has arranged for reports on Canadian lamp sales statistics, including fluorescent, and will further report on other phases of lighting including domestic, commercial, industrial and street and highway lighting. Adapter units for modernization of home lighting at low cost came up for discussion also and an exhibit of these units was set up.

The possibility of forming a Water Systems Council was discussed with pump manufacturers by the *Rural Service Committee* and further information will be secured in this regard. The functions of the agricultural engineer employed by the utility, milk coolers, the holding of rural meetings and other subjects were also discussed.

Two papers on Commercial Electric Cooking in addition to papers on Air Conditioning and the Sterilamp were heard and discussed by the *Commercial Sales Committee* which also discussed rates for commercial loads and the desirability of having the proper type of utensils for use on ranges.

In the Engineering Section the *Electrical Equipment Committee* discussed Limiting Temperatures; Testing Insulation; Improved Generator Cooling and Cleaning; Substations; Rehabilitation of Circuit Breakers and Standardization of Transformer Bushings, and Oil Circuit Breakers.

Progress on Railway Crossing Specifications was reported at the meeting of the *Overhead Systems Committee* which also devoted some time to Radio Interference; Expulsion Gaps; Field Testing of Distribution Transformers; Standardization of Distribution Transformers and Pole Line Equipment and other matters of interest to those present.

The *Steam Power Committee* submitted a paper outlining steam plant development and installation in Canada; a description of Pulverized Fuel-Fired Integral Type Boiler.

Cleaning and Conditioning Duct Runs; Mechanical Connectors for 600 volt Insulated Cables; Neoprene Sheathed Cables rated at 5000 volts and an operation report on solid type P.I.L.C. 60-kv Cables with oil-filled joints were discussed by the *Underground Systems Committee* and a new subject, "Soil Corrosion," was discussed in general and will be reported upon later.

The *Systems Co-ordination Committee* devoted its time to discussion of Standard Height for Lighting Fixtures on Jointly Used Poles; effect of Single Phase Switching in taps from 3 phase lines on induced voltages in communication lines; Joint use in Long Span Rural Construction and Earth Resistivity Surveys.

Standardization of Instrument Transformers and Meter Terminal Connections were discussed by the *Metering Equipment Committee* in addition to Meter Rating and Testing; New Sequence Metering and Combination Two and Three Wire Meters.

The *Grounding Committee* discussed a Ground Leakage Relay; a method of Evaluating Ground Resistances; the effect of disconnection of the neutral wire when thawing frozen water pipes.

Comfort of Drivers; Truck Body Design; Clearance Lights; Speed Governors; Chains and Flares were discussed by the *Motor Vehicles Committee*.

Adequate Wiring and acceptance by the N.F.P.A. of thin-wall insulation were discussed by the *Wiring Committee* and it was suggested that the Canadian Electrical Code might be revised to include thin-wall insulation.

On the afternoon of the second day, following Group meetings of all Committees of the General, Utilization and Sales, and Engineering Sections a paper was read at a General Session of all delegates on the subject "Accounting Aspects of Engineering Problems," by James M. Seay, Vice-president and Controller, New York Power & Light Corp., Albany, N. Y.

J. E. Lawson, president of the Association, addressed the delegates on the power requirements of Ontario in relation to present and proposed developments on the Niagara and St. Lawrence Rivers and other power sites in that Province.

A dinner was held on the evening of the first day of the Conference at which 265 delegates were in attendance when colored moving pictures of the last C.E.A. Convention at Digby, Nova Scotia, were shown.

At the Executive Meeting, held following the Conference, it was decided to hold the Fiftieth Annual Convention of the Association at the Seigniory Club, P.Q., June 26-28, 1940.

Use of Radio in Special Emergencies

A release of the Federal Communications Commission, Jan. 22

THERE is one class of radio station license issued by the Federal Communications Commission which, though little known, is playing an increasingly important role in the economic life of the nation. This particular type of license covers special emergency stations. These stations have already demonstrated their value in time of localized stress, and now loom as a valuable adjunct to the linking of communications for widespread protection of life and property.

Special emergency stations have rendered valuable service in regional disasters, such as the New England hurricane and in time of flood when the normal means of communication are destroyed or are rendered inoperative. It would be difficult to obtain information as to casualties and extent of damage, and even more difficult to restore communication, were it not for the temporary facilities which can be rapidly established to meet such emergencies. The use of special emergency stations in this connection is probably the most spectacular use to which these stations are now put.

The Long Lines Division of the American Telephone and Telegraph Company, as well as many local telephone companies, have been issued licenses for special emergency stations. Special equipment has been designed for the purpose. This equipment can be stored in a chest. In time of emergency, it can be loaded in a truck, driven to the scene, and quickly and easily set up for operation. When so used, the design of these stations permits either communication between construction crews at the scene of the emergency or the interconnection of regular land lines in such manner that regular subscriber communication can be re-established.

Aside from service in time of disaster, these stations are in growing daily use by public utilities. For example:

The economic life of our country has become so dependent upon electricity that a sudden and complete disruption of electric service to any large metropolis would make that city practically uninhabitable. The network of interconnecting electric power lines has greatly reduced the hazards which would be created by failure of a single plant. However, constant vigilance is required to maintain the transmission lines, which constitute this network, for the most efficient service. As these transmission lines normally carry very high voltages, and since they cannot be disconnected for any extended period, close coordination is needed between the working parties and the switching central at the power house.

Special emergency stations make this possible. Some utility engineers say the time is rapidly approaching when no power distribution system or gas, oil, or water distribution system operating over a large area will be considered fully equipped unless it has a radio communication system to augment the wire, telegraph, telephone, and carrier current communication systems.

There is a particular day-to-day emergency demand for radio communication by public utilities within the metropolitan districts. To illustrate: Should an automobile run into a light pole and knock it down, electrical voltages of dangerous potentials are exposed and endanger passers-by. Also, there have been occasions in which a street car has run over a pedestrian and in order to remove the victim it has been necessary to jack up the street car from the rail. Without radio communication, it is necessary for a service truck to be dispatched from some far quarter to the scene even though a truck with proper equipment might be working only a block or two away.

Other emergency services of this nature include repairs of wires downed because of sleet, and restoration of power to hospitals, etc. To meet these situations, the Commission allocates appropriate frequencies and issues authorizations to public utilities interested solely in metropolitan area service.

Inasmuch as the number of frequencies available for such assignment is extremely limited, it is required that those public service units eligible to receive emergency station licenses cooperate among themselves in the choice and use of frequencies so as to avoid duplication and interference. For this and other reasons it has become common practice for various public utilities in a single area to pool their needs, one utility requesting the license and rendering the service while the other utilities receive this service and contribute to the cost of operation on a pro-rated basis.

Recent Commission authorizations illustrate this arrangement.

In the New York metropolitan area there are a number of public utilities, including the New York Telephone Company, which are eligible for, and have need of, special emergency radio communication. In order to reduce the capital investment and to receive the maximum benefits from this type of communication, the New York Telephone Company has taken the lead and is constructing a sufficient number of special emergency stations to serve all utilities in that metropolitan area.

This radio service will be made available for the handling of only such communications as meet the definition of emergency in the Commission's rules and regulations. In order that the cost of operation may be recovered, and to prevent this new system from becoming a burden on the general telephone subscriber, the telephone company is to make charges to the various utilities concerned, in much the same manner as to the telephone and teletype subscribers.

In other words, a definite charge per call will be made and the company will be given a guarantee in the form of a minimum service charge.

On January 1 of this year, 76 special emergency systems involving 368 individual transmitters had been authorized by the Commission.

The rules and regulations governing special emergency stations appear as Part 10 of the Rules and Regulations of the Federal Communications Commission, which are available in pamphlet form from the Superintendent of Documents, Government Printing Office, Washington, D. C., at a cost of 5 cents a copy. Information and application forms may be obtained either from the Washington headquarters of the Commission or from any of its field offices.

EDITOR'S NOTE: The following list shows the electric light and power companies which have to date applied to the Federal Communications Commission for emergency communication station licenses.

Appalachian Electric Power Company, Roanoke, Va.

Boston Edison Company, Boston, Mass.

Buffalo Niagara Electric Co., Buffalo, N. Y.

Dayton Power and Light Company, Dayton, Ohio.
Detroit Edison Company, Detroit, Mich.
Florida Power and Light Co., Miami, Fla.
Indiana & Michigan Elec. Co., St. Joseph, Ind.
Indiana Service Corp., Ft. Wayne, Ind.
Kansas Gas and Electric Co., Wichita, Kan.
Kansas City Power and Light Co., Kansas City, Mo.
Louisville Gas and Electric Co., Louisville, Ky.
The Montana Power Company, Butte, Mont.
New England Power Company, Boston, Mass.
Northwestern Electric Company, Portland, Ore.
Ohio Public Service Company, Alliance, Ohio.
Pacific Gas & Electric Co., San Francisco, Calif.
Pennsylvania Power and Light Co., Allentown, Pa.
Philadelphia Electric Company, Philadelphia, Pa.
Portland General Electric Co., Portland, Ore.
Potomac Electric Power Co., Washington, D. C.
Puget Sound Power and Light Co., Seattle, Wash.
Southern California Edison Company, Ltd., Los Angeles, Calif.
Washington Water Power Co., Spokane, Wash.

From this list it will be noted that use is being made of this service, or planned, in large metropolitan centers for emergency communication between important stations, as well as to improve operation in sparsely settled territory.

Reports received from the companies making extensive use of emergency radio communication indicate that it has proven to be a great aid in the restoration of service, and in reducing hazard to life and property where failure of lines or service has occurred.

Many companies that started with a relatively modest installation have already found it advisable to substantially increase the radio facilities available for such service.

FCC Will Accept Applications for Experimentation with Frequency Modulation

A release of the Federal Communications Commission, Jan. 25

TO obtain more factual data about frequency modulation for services other than broadcast, the Federal Communications Commission today (Jan. 25) announced that it will accept applications for such experimental authorizations on the frequencies allocated to those services above 30,000 kilocycles.

This applies to such services as emergency, aviation, and those miscellaneous radio services not directly involved by the Commission's informal engineering hearing, scheduled to begin Feb. 28, primarily to consider frequency modulation as applied to the standard broadcast service.

Frequency modulation is claimed to offer definite advantages over existing amplitude modulation systems in the police and aviation services. In the police service each system is under the direct control of one licensee who can plan and control the installation and operation of both the transmitting and receiving systems. There are approximately 1000 police radio systems with more than 6000 transmitters (including headquarters and patrol cars) now using amplitude modulation.

On the basis of the reports required to be submitted under the experimental rules, and after observation of operation by Commission personnel, decisions will be reached as to whether and under what conditions frequency modulation can be regularly authorized for use in the non-broadcast services.

PUAA Western Conference

WITH registration of delegates from all sections of the country representing a complete cross-section of all phases of the public utility industry, the second annual western conference of the Public Utilities Advertising Association was successfully staged at Denver, Colo., Jan. 12 and 13.

Keynote and theme of the conference sessions was the place and opportunity of PUAA in devising solutions to the many and complex problems faced by the utility business. Sessions were devoted exclusively and intensively to "shop talk" that covered more completely than ever before a range of public relations and promotional activities concededly essential to the industry's success.

The program subjects included employee publications, advertising evaluation methods, gas industry advertising, dealer cooperation, outdoor advertising, art and mechanical costs, copy clinics, adequate wiring, radio advertising, press relations and numerous other topics of current importance to utility advertisers.

Keith Hartzell, president of the association, presided at the meetings. Official host to the conference was the Public Service Company of Colorado with PUAA director Frank R. Jamison acting as chairman of the local arrangements committee.

Among the papers which prompted some of the most candid discussion were those by Kenneth Magers, Cincinnati Gas & Electric Co., and E. W. Edwardson, Nebraska Power Co., on the subject, "Employee Publications"; a critical analysis of the subject, "The Gas Industry Needs to Advertise," by C. V. Sorenson, Midland Utilities Co., Hammond, Ind.; and a paper and discussion on the subject, "Some Do's and Don't's on Dealer Cooperation," by Paul Hoheisel, sales and advertising manager, Oklahoma Gas and Electric Co., Oklahoma City.

Pacific Coast Electrical Association Convention in May

THE 1940 Annual Convention of the Pacific Coast Electrical Association will be held at Hotel Oakland, Oakland, Cal., on May 22, 23 and 24.

This will be a combination of the customary Spring Conclave and Annual Convention. Two half-day sessions will be devoted to informal discussion groups and committee meetings and the remainder of the sessions will be general assemblies devoted to the Convention program.

Annual Convention of Greater New York Safety Council

THE Eleventh Annual Convention of the Greater New York Safety Council is scheduled to be held at the Hotel Pennsylvania in New York, on April 16, 17 and 18, 1940. The convention will be held in cooperation with some eighty local and national organizations, and will include about forty sessions covering such diversified phases of accident prevention as occupational, traffic, educational and home safety.

It is expected that the program for the convention will be available some time in early March; anyone interested in receiving a copy may do so by writing directly to the Greater New York Safety Council, Inc., Lincoln Building, 60 East 42nd Street, New York City.

PERSONALS

ALEX DOW resigned this month as president of The Detroit Edison Company to become chairman of the executive committee of the company. ALFRED C. MARSHALL, vice-president and general manager of The Detroit Edison since 1923, was elected to succeed Mr. Dow.

Mr. Dow began his business career in America with the B. & O. R.R. shortly after arrival from Glasgow in 1882, at the age of 20. In 1888 he got a job with the Brush Electric Company as installation electrician in Chicago. He left Chicago in 1893 to go to Detroit. In 1896 he became vice-president and general manager of the Edison Illuminating Company of that city and of its successor, Detroit Edison, upon its founding in 1903. In December, 1912, Mr. Dow was elected president of Detroit Edison, the position he continued until this month.

Mr. Marshall, in addition to his work with the Detroit Edison Co., has served as president and general manager of the Port Huron Light and Power Company, chief engineer of the Rapid Transit Company of Detroit, assistant to the president of Eastern Michigan Edison Company (a subsidiary which was absorbed by Detroit Edison), and as one of the three trustees who had charge of liquidation of assets of Detroit Trust Company in 1934. He has been a vice-president of Detroit Edison since 1913 and, like Mr. Dow, an important factor in his city's civic life.

FRANK M. KERR, president and general manager of the Montana Power Company, retired last month from active work as president of the company. He was succeeded by FRANK W. BIRD. Mr. Kerr's retirement was announced at a meeting held at the Finlen Hotel, Butte, and presided over by M. E. Buck, Vice-President and General Superintendent. At this meeting Mr. Kerr was the recipient of numerous compliments bestowed by speakers, telegrams and letters, indicative of the regard in which he is held, not only by the employees of the Montana Power Company but of people scattered throughout the state and the nation.

Mr. Kerr became general manager of the Montana Power Company in 1915, and was elected vice-president in 1916, succeeding later to the presidency of the company. He will continue as honorary president.

Mr. Bird, formerly vice-president and assistant general manager, has been identified with the company since its organization. He was engaged with the Montana Reservoir and Irrigation Company from June, 1910, continuing when that concern was joined with other enterprises to form the Montana Power Company.

JAMES H. POLHEMUS, for the past four years Executive Vice-President of the Portland Electric Power Company and its affiliates, Portland General Electric Company and Portland Traction Company, has been elected President of the Portland General Electric Company to succeed FRANKLIN T. GRIFFITH, who becomes Chairman of the Board of Directors. Mr. Griffith's resignation as President was submitted at the meeting of the Board of Directors February 7, the day after his 70th birthday.

MR. GRIFFITH, as a young lawyer in Oregon City, joined the company's predecessor as division counsel in 1894 and was named associate general counsel in 1900 and general attorney in 1909. He became President of Portland Electric Power Company and all of its affiliates in 1913. Mr. Griffith was elected First Citizen of Portland, Oregon, for 1938, and has been actively identified with many civic activities. The evening before Mr. Griffith retired as President of the Portland General Electric Company he was a guest of honor at a large birthday dinner attended by several hundred citizens, at the Arlington Club.

MR. POLHEMUS was graduated from Stanford University in civil engineering in 1911. He was Field Engineer and Superintendent of Constuction of The Dalles-Celilo Canal, built by the United States Engineers from 1911 to 1914. From 1914 to 1918 he was in charge of dredging and harbor improvements made by the Army Engineers on Coos Bay, Oregon, and from 1918 to 1920 was General Manager and Chief Engineer of the Coos Bay Ship Building Company. In 1920 Mr. Polhemus was elected General Manager and Chief Engineer of the Port of Portland and served from 1920 to 1936, retiring as General Manager of the Port of Portland to become Executive Vice-President of Portland Electric Power Company and its affiliates.

JAMES WILSON, president of the Shawinigan Water and Power Company, was elected president of Quebec Power Company, to succeed the late Julian C. Smith. W. S. HART, vice-president of the Shawinigan Water and Power Company, has been elected a vice-president of Quebec Power Company and will continue to act as treasurer. H. G. BUDDEN was named secretary of the company, filling the position formerly held by Mr. Wilson. R. J. BEAUMONT, an assistant general manager of Shawinigan, has been elected a director of Quebec Power Company, filling the vacancy caused by the death of Mr. Smith.

R. R. VAN HORN has been elected president of the Luzere County Gas and Electric Corporation, Kingston, Pa., succeeding A. J. LLEWELLYN who has retired. Mr. Van Horn was vice-president of the corporation since 1929 and had been associated with the public utility business in Wyoming Valley for more than 35 years, first entering the employ of the Luzerne County Gas and Electric Corporation in 1908.

Mr. Llewellyn's retirement comes after 39 years of service to the Luzerne company, covering practically his entire business life. His history with the Luzerne company was in the good American pattern—the story of the local boy who rose to the presidency. Reading meters was his first job; then, holding in succession the positions of collector, bookkeeper, solicitor, arc lamp trimmer, lineman, superintendent, manager and vice-president, he was elected to the presidency in 1938.

JAMES M. HUEBNER has been appointed vice-president of the Lancaster Division of the Pennsylvania Power and Light Company. Last March Mr. Huebner was transferred to the Lancaster Division of the company in the capacity of division manager and in his recent promotion succeeds the late Ralph B. Hull.

Prior to his duties at Lancaster, Mr. Huebner was division manager of the company's Bethlehem division, with headquarters at Bethlehem, in which capacity he served for 13 years. He formerly had served as a district manager and in various other capacities.

ROBERT E. GROH, formerly division commercial manager, was appointed assistant to the vice-president of the Lancaster division; J. S. WISE, 3RD, formerly assistant to division vice-president, was appointed district manager of the Lancaster district of the company, and

G. T. STORB, formerly power sales engineer, was appointed division commercial manager of the Lancaster division.

Mr. Groh has been connected with the Lancaster organization since 1927. Mr. Wise has been associated with Pennsylvania Power and Light Company in various capacities for the past 14 years. Mr. Storb became connected with the Lancaster organization in 1927 and has served in the capacities of statistician, engineer and technical supervisor during the past 12 years.

HAROLD G. RAHN, for the past 10 years electric refrigeration and range sales supervisor for the Buffalo Niagara Electric Corporation, has been appointed dealer contact man for the Electrical League of the Niagara Frontier, with headquarters in Buffalo, N. Y.

L. P. GOETZ has been appointed valuation engineer for the Utah Power and Light Company, Salt Lake City.

At a meeting of the board of directors of The United Gas Improvement Company held Jan. 23, WILLIAM H. TAYLOR resigned as a director of the company and HORACE P. LIVERSIDGE, president of the Philadelphia Electric Company, was elected a director in his stead.

FRANCIS J. BRETT, vice-president and controller of Niagara Hudson Power Corporation, was elected a director of the corporation this month.

Mr. Brett's connection with the corporation and its subsidiary companies extends over a period of 32 years. He worked through various departments of The Niagara Falls Power Company as office boy, payroll clerk, bookkeeper, accountant, and, in 1917, became general auditor of the Tonowanda Power Company. Shortly after the formation of Buffalo, Niagara and Eastern Power Corporation in 1925 Mr. Brett became its assistant treasurer and later its treasurer. When, in 1929, Niagara Hudson Power Corporation was formed as the parent company, he became its assistant treasurer. In 1930 he became its controller, and in 1936 a vice-president.

F. A. ROBBINS of the Superior Water, Light and Power Company, Superior, Wis., has recently assumed responsibility for the general engineering work of the electric, gas and water utilities of the company. G. A. CORINE will be general superintendent in charge of all of the operating facilities of the company and HARVEY C. SARGENT will be electrical superintendent.

FRANK R. PHILLIPS, president of the Philadelphia Company and subsidiary companies of Pittsburgh, Pa., has announced the election of HOWARD D. MEGAHAN as treasurer for these companies, succeeding C. J. Braun, Jr., who died recently after 40 years of service with the company.

Mr. Megahan was graduated in 1920 from Allegheny College at Meadville, Pa., after which he entered the Law School of the University of Pittsburgh. He was admitted to the Bar in October, 1933, and for a short time practiced law.

In 1925 Mr. Megahan entered the service of the Philadelphia Company in its law department, and was made assistant treasurer in 1937.

W. G. B. EULER has been appointed chief engineer of Pacific Gas and Electric Company. The position of vice-president in charge of engineering, held by the late Arthur H. Markwart, is not being filled, but Mr. Euler succeeds to the authority held by Mr. Markwart. He will continue also to act as general superintendent of the company's San Francisco and East Bay divisions.

Mr. Euler was graduated from the University of California in electrical engineering in 1905 and joined the Great Western Power Co.'s engineering staff in 1910. When that company merged with P. G. & E. he was general superintendent in charge of operations.

R. E. CAYWOOD and B. C. SPRAGUE of the research department of West Penn Power Company have been awarded first prize of $300 in the Modern Kitchen Bureau's 1939 national contest for utility executives and engineers. The contest was for the best paper on the "Advisability of Competitive Water Heater Rate and Advantages of the Water Heater Load."

Second award and cash prize of $200 went to ROY THURMAN of the Indianapolis Power and Light Company.

The unusual window display designed by HARRY F. STRONG and ERNEST VOGT won for the Coshocton, Ohio, office of Ohio Power Company first honors and a cash award of $100 in the Modern Kitchen Bureau's 1939 national electric water heater window display contest.

Second prize of $50 went to Kansas Power and Light Company, Hutchinson, Kan., whose display was constructed by ANDY HESS. Awards of $10 each were made to Minnesota Power and Light Company, Duluth; Ohio Power Company, Portsmouth; Nebraska Power Company, Omaha; Kansas Gas and Electric Company, Wichita; Philadelphia Electric Company; Tampa Electric Company; Gulf States Utilities Company, Beaumont, Tex.; Ohio Edison Company, Youngstown, and Northwestern Electric Company, Portland, Ore.

"AND THERE WAS LIGHT"

From the Jackson (Mich.) *Citizen Patriot*

"Wide circulation should be given the report of Dan E. Karn, vice-president and general manager of Consumers Power Co., that 66,511 farms of the 93,846 in 608 Michigan townships served by his company now have electric service. Especially should this information be made known to the primitive east, where a large percentage of the residents who never have been west of the Alleghenies have the idea that Indians roam our streets and everybody rides a horse to and from work.

"Five years ago only 24 per cent of these farms had power and light facilities. Chores were done by lantern light, the family reading was done by kerosene lamp light, and the "armstrong" method was employed in doing many chores, unless one was fortunate enough to own a gasoline motor. The house that is not lighted by electricity, or the barn that is not connected with electric power wires is the exception rather than the rule in this vicinity.

"The Consumers Power Co. deserves much credit for its achievements in the rural areas. Certainly the addition of electrical energy lessens the farmers' burden and makes life in the rural areas more enjoyable. This contribution to labor saving alone is a real accomplishment, not to mention the benefits derived from good lighting, the availability of modern household equipment, electric radios and other home features once regarded only as luxuries for city dwellers.

"In carrying out the Biblical injunction, 'let there be light,' Consumers is fulfilling its mission well. To Mr. Karn and his organization we offer congratulations for what has been done, and to the 24 per cent of the farms still to be served, may 1940 and succeeding years bring 'more power to you.'"

RECENT E.E.I. PUBLICATIONS

TURBINES, CONDENSERS AND PUMPS, 1939

E.E.I. Pub. G-7. A report of the Turbines Subcommittee of the Prime Movers Commitee, Edison Electric Institute, 32 pages. Price 70c. to members and their employees; $1.75 to non-members in the U.S.A.; $1.85 to foreign countries.

This report contains a committee statement, statement by operating companies and also a statement by manufacturers on:

Turbine Operating Data For Year 1938.

Operating Experiences With 3,600 Rpm. Turbo-generators Above 10,000 Kw.

Turbine Instruments.

Feed-water Heaters.

New Turbine Installations.

New Condenser Installations.

Condenser Tubes and Packing

Condensed Leakage.

Condensed Auxiliaries And Piping.

Methods of Maintaining Good Heat Transfer in Condensers.

CABLE OPERATION—1938

E.E.I. Pub. G-5. A report of the Transmission and Distribution Committee, Edison Electric Institute, 36 pages. Price 60c. to members and their employees; $1.50 to non-members in the U.S.A.; $1.60 to foreign countries.

The 55 companies which contributed data for this report had 395 miles of 1938 vintage high voltage paper-insulated cable operating on their systems at the end of the year.

The trouble rate for all high voltage cable of 6.3 was the lowest yet reported since the Committee started gathering removal data in 1934. The failure rate of 4.7 is the lowest yet reported. For the third consecutive year there has been a steady decrease in the test failure rate to a value of 0.8, the lowest value noted since 1930.

The trouble rate for paper-insulated cable was 6.2, a decrease of 11 per cent from last year's value. The failure rate decreased 7.1 per cent and the removal rate decreased 22 per cent as compared with the 1937 values.

The trouble rate for all high voltage joints was 1.7. This rate is composed of a service failure rate of 0.8, a test failure rate of 0.3, and a removal rate of 0.7. The combined service and test failure rate is 14 per cent higher than the corresponding 1937 value. The removal rate, however, is 34 per cent lower.

The trouble rate for potheads integral with apparatus was 0.6, the failure rate being 0.5 and the removal rate 0.1. Potheads installed outdoors had a trouble rate of 14, the failure rate being 5.3 and the removal rate 8.5. Potheads installed indoors had a trouble rate of 1.0, the failure rate being 0.7 and removal rate 0.3. These three groups of potheads had marked decreases in the 1938 trouble rates when compared with those of 1937. The decrease in the trouble rate for potheads integral with apparatus was 83 per cent, for potheads installed outdoors 12 per cent, and for potheads installed indoors 68 per cent.

Approximately 70 per cent of the cable and joints covered in this report were subjected to high potential tests. Unlike the data of last year the cable failure rate in service on tested cable was 16 per cent higher than for untested cable. The joint failure rate in service, as in past years, on tested cable was 13 per cent lower than the corresponding rate for joints on untested cable.

There has been a downward trend in the number of high potential tests made during the past four years. Of the 3,477 tests made during 1938, 20 per cent were made with a-c potentials and 80 per cent with d-c potentials. The average ratio of test to operating voltage was 1.5 for a-c test voltages with a maximum ratio of 3.1 and a minimum ratio of 1.0. For d-c test potentials this ratio was 4.0 with a maximum ratio of 6.3 and a minimum ratio of 1.6. Approximately one out of every 15 tests produced a cable, joint or pothead failure.

For the first time since the Committee started gathering data on removals the trouble rate on solid-type paper-insulated cable with joints connected to oil reservoirs is 2.8 per cent lower than for cables without oil reservoirs. The joint trouble rate on joints connected to oil reservoirs was 52 per cent lower than for joints not so connected.

Data submitted by the Electrical Testing Laboratories covering the assigned causes of 787 cable troubles shows that approximately one-half were assignable to one of four causes, namely: initially defective sheath, deterioration in cable over ten years old, sheath corrosion and external mechanical damage. These four causes accounted for 13, 7.2, 19 and 8.9 per cent respectively of all cable troubles.

New Standards Ready

(*Continued from page* 75)

pole, or using the T-crossarm hanger which provides several positions at intervals of three inches.

Ease of bolting transformers direct to pole makes it practicable for line carrying only single-phase primary laterals, as is the case in much residential area, to eliminate crossarms, not only with cost savings, but with gain to public relations from improved line appearance.

Uniformity of position and of solderless connectors of low-voltage terminals, especially where heavy secondary mains and risers prevail, provide a distinct operating convenience in ready interchanging of transformers.

Uniform locations and arrangements of grounding terminals and of name-plate provide added convenience and increased safety.

The transformer support lugs design provides a ready means for mounting, by brackets or directly, of cutout, lightning arrester or other accessories, often avoiding the necessity of a crossarm for this purpose.

The support lug design incorporates a simple but effective "jump" resisting safety feature.

The adequate spacing of the transformer tank from the pole provided by the liberal length support lugs, together with systematized arrangement and uniformity of location of bushings, grounding lugs, and nameplate, through systematic pole-top arrangements contribute substantially to safety of workmen.

Approximately six months will be required on the part of the manufacturers before transformers embodying the standard features provided in the report will be available to the users. This period of time is essential for the preparation of shop drawings, building of tool equipment, and other adjusting of production and distribution procedures.

"Accounting of Tomorrow" —Editor's Note

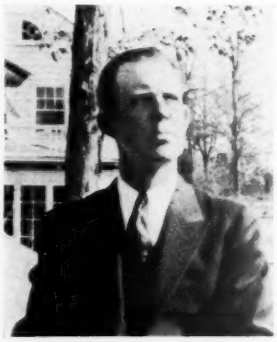
The article "Accounting of Tomorrow" by Mr. Charles B. Couchman, published in the November, 1939, BULLETIN, was abstracted from Mr. Couchman's address before the National Accounting Conference at Chicago, Nov. 15, and was not his complete address as was implied by the notation heading the article.

Resuscitation Medals Awarded

(*Continued from page 72*)

DAVID LAWRENCE CONLY
New Jersey

At Bridgeton, N. J., on July 10, 1939, while attempting to connect a transformer ground wire to the driven ground on a pole, Ernest Baum's head touched a section of the cut-out to transformer. Baum, a member of a line crew of the Atlantic City Electric Company, was shocked unconscious. Two of his fellow employees lowered him from the pole



DAVID L. CONLY

and David Lawrence Conly, foreman of the crew, immediately applied the Prone Pressure Method of Resuscitation. After about 20 minutes the patient was breathing without assistance and was removed to a local hospital. Baum suffered first degree burns on top of head, and third and fourth fingers of left hand, and contusion on left side of head.

Mr. Conly was presented with the Medal and Certificate by Mr. William H. Meyers of the Atlantic City Electric Company at a meeting of the Supper Club which was attended by employees and outside men on Dec. 4, 1939. The Atlantic City papers carried a full story of the case and the presentation of the Medal.

THOMAS ALBERT BRUSCH
Louisiana

At 11:05 a. m. on June 28, 1939, Louis A. Jones, an employee of Southwestern Gas & Electric Company, Shreveport, La. was working on a step-ladder behind a switchboard taping non-energized bus-bar riser from OCB to bottom of disconnect on switchboard. His right sleeve, which was saturated with perspiration, came in contact with an energized terminal and fell clear from the circuit. The arc had set fire to Jones' shirt. Thomas Albert Brusch, general foreman, with the aid of a fellow employee, ripped off the burning garments and carried Jones from behind the board to a cleared space. Brusch immediately applied resuscitation and in about 15 minutes Jones was breathing normally. Shortly thereafter he was removed to a hospital.

The presentation of the Medal to Mr. Brusch was made by Mr. M. T. Walker, Vice-President of the Southwestern Gas and Electric Company, at the annual Christmas party for employees and their families at Shreveport, La., Dec. 22, 1939.

CONVENTIONS AND MEETINGS

FEBRUARY

22-23 Southeastern Electric Exchange, Engineering and Operation Section, Robert E. Lee Hotel, Jackson, Miss.
29-Mar. 1 Northwest Electric Light & Power Association, Annual Business Development Meeting, Olympic Hotel, Seattle, Wash.

MARCH

18-23 General Sales Conference, E.E.I., Edgewater Beach Hotel, Chicago, Ill.
18-19 Oklahoma Utilities Association, The Biltmore Hotel, Oklahoma City, Okla.
19-20 Missouri Valley Electric Association, Joint-Rural-Sales Conference, Continental Hotel, Kansas City, Mo.
21-22 Missouri Valley Electric Association, Engineering Conference, Continental Hotel, Kansas City, Mo.

APRIL

9-10 Midwest Power Conference, Palmer House, Chicago, Ill.
11-12 American Gas Association, Accounting Section, The Greenbrier, White Sulphur Springs, W. Va.
16-18 11th Annual Greater New York Safety Council Congress, Hotel Pennsylvania and Hotel Governor Clinton, New York, N. Y.
17-19 Missouri Association of Public Utilities, Elms Hotel, Excelsior Springs, Mo.
25-26 National Power Sales Conference, Roanoke, Va.
29-May 2 Chamber of Commerce of the U. S. A., Washington, D. C.

MAY

1-3 American Society of Mechanical Engineers, Spring meeting, Worcester, Mass.
6-9 Technical Committees, E.E.I., Edgewater Beach Hotel, Chicago, Ill.
8-11 National Fire Protection Association, Atlantic City, N. J.
9-11 Southeastern Electric Exchange, Hotel Roanoke, Roanoke, Va.
12-17 National Electrical Manufacturers Association, The Homestead, Hot Springs, Va.
14-17 National District Heating Association, French Lick Springs Hotel, French Lick Springs, Ind.
19-23 National Electrical Wholesalers Association, The Homestead, Hot Springs, Va.
22-24 Pacific Coast Electrical Association, Hotel Oakland, Oakland, Calif.
24-28 Westinghouse Agent-Jobbers Association, The Homestead, Hot Springs, Va.

JUNE

3-6 EDISON ELECTRIC INSTITUTE, Atlantic City, N. J.
3-6 National Association of Purchasing Agents, Cincinnati, Ohio.
24-27 National Association of Cost Accountants, St. Louis, Mo.

SEPTEMBER

4-6 Pennsylvania Electric Association, Bedford Springs Hotel, Bedford Springs, Pa.
9-12 Illuminating Engineering Society, Essex and Sussex Hotel, Spring Lake, N. J.
25-27 Indiana Electric Association, French Lick Springs Hotel, French Lick Springs, Ind.
26-27 The Empire State Gas and Electric Association, Westchester County Club, Rye, N. Y.

PUAA Better Copy Contest

THE 1940 Better Copy Contest of the Public Utilities Advertising Association will be conducted on a regional basis preliminary to the national contest.

The series of regional contests will be supplementary to the national contest, each region selecting the best advertisements for official certificates of merit. All winners in the various regions will then be submitted in the national contest and the same number of national awards will be made as in former years.

The contest, which will cover advertisements published in 1939, is open to all public utility companies. Further information and a copy of the rules and conditions can be secured from Mr. T. H. Spain, 80 Park Place, Newark, N. J.

Progress of Electric Utilities

(*Continued from page 48*)

potential developments is to offer the incentive of profit and to run the risk of some mistakes, some failures and some abuses. Mistakes happen when men try to get things done, especially new things. Every engineer who has accomplished anything worth while has made them.

The public could well afford to suffer a few mistakes and abuses and to offer strong incentives for enjoyment of future benefits such as have been wrested from natural forces in the past decades; for they have received handsome returns in the multiplying of opportunities for gainful employment, in converting rare luxuries into commonplace enjoyments, in easing the burdens of mankind and increasing his comforts.

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1939-1940

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